

UNITED STATES INTERNATIONAL TRADE COMMISSION

In the Matter of:	)	Investigation No.
CERTAIN VIDEO CAPABLE ELECTRONIC	)	337-TA-1380
DEVICES, INCLUDING COMPUTERS,	)	
STREAMING DEVICES, TELEVISIONS,	)	
AND COMPONENTS AND	)	
MODULES THEREOF	)	

OPEN SESSIONS

Pages: 1 through 321 (with excerpts)
Place: Washington, D.C.
Date: September 9, 2024

HERITAGE REPORTING CORPORATION

Official Reporters
1220 L Street, N.W., Suite 206
Washington, D.C. 20005
(202) 628-4888
contracts@hrccourtreporters.com

1 UNITED STATES INTERNATIONAL TRADE COMMISSION
2 Washington, D.C.
3 BEFORE THE HONORABLE CAMERON R. ELLIOT
4 Administrative Law Judge

5 _____
6 In the Matter of:) Investigation No.
7 CERTAIN VIDEO CAPABLE ELECTRONIC) 337-TA-1380
8 DEVICES, INCLUDING COMPUTERS,)
9 STREAMING DEVICES, TELEVISIONS,)
10 AND COMPONENTS AND)
11 MODULES THEREOF)

12 _____
13
14 International Trade Commission
15 500 E Street, S.W.
16 Washington, D.C.

17
18 Monday, September 9, 2024

19
20 EVIDENTIARY HEARING - VOLUME I

21
22 The Hearing commenced in Courtroom A, pursuant to the
23 notice of the Judge, at 9:00 a.m. Eastern.

24
25 Reported by: Karen Brynteson, FAPR, RMR, CRR

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES:

2

3 For Complainants Nokia Technologies Oy and Nokia
4 Corporation:

5 ADAM D. SWAIN, ESQ.

6 Alston & Bird LLP

7 950 F Street, N.W.

8 Washington, D.C. 20004

9

10 JOHN D. HAYNES, ESQ.

11 NICHOLAS T. TSUI, ESQ.

12 MARK A. McCARTY, ESQ.

13 DAVID S. FRIST, ESQ.

14 Alston & Bird LLP

15 1201 West Peachtree Street

16 Atlanta, GA 30309

17

18 THEODORE STEVENSON, ESQ.

19 Alston & Bird LLP

20 2200 Ross Avenue, Suite 2300

21 Dallas, TX 75201

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 For Complainants Nokia Technologies Oy and Nokia
3 Corporation:

4 JENNIFER D. CIELUCH, ESQ.

5 Alston & Bird LLP

6 90 Park Avenue

7 New York, New York 10016

8

9 WARREN LIPSCHITZ, ESQ.

10 SAM MOORE, ESQ.

11 ERIK B. FOUNTAIN, ESQ.

12 McKool Smith PC

13 300 Crescent Court, Suite 1200

14 Dallas, TX 75201

15

16 R. MITCH VERBONCOEUR, ESQ.

17 JOSHUA J. NEWCOMER, ESQ.

18 McKool Smith PC

19 303 Colorado Street, Suite 2100

20 Austin, TX 78701

21

22 LAUREN SIMENAUER, ESQ.

23 McKool Smith

24 1999 K Street, N.W., Suite 600

25 Washington, DC 20006

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent Amazon.com, Inc. and
3 Amazon.com Services LLC:

4 THOMAS N. MILLIKAN, ESQ.

5 KYLE CANAVERA, ESQ.

6 Perkins Coie LLP

7 11452 El Camino Real, Suite 300

8 San Diego, CA 92130

9

10 VERONICA S. ASCARRUNZ, ESQ.

11 EMILY RICH, ESQ.

12 Perkins Coie LLP

13 700 13th Street, N.W., Suite 800

14 Washington, D.C. 20005

15

16 STEFANI E. SHANBERG, ESQ.

17 ROBIN L. BREWER, ESQ.

18 KARL JOHNSTON, ESQ.

19 Perkins Coie LLP

20 505 Howard Street, Suite 1000

21 San Francisco, CA 94105

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent Amazon.com, Inc. and
3 Amazon.com Services LLC:

4 ANDREW KLEIN, ESQ.

5 Perkins Coie LLP

6 3150 Porter Drive

7 Palo Alto, CA 94304

8

9

10 MARTIN R. BADER, ESQ.

11 RYAN CUNNINGHAM, ESQ.

12 Sheppard, Mullin, Richter & Hampton LLP

13 12275 El Camino Real, Suite 100

14 San Diego, CA 92130

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 STEPHANIE L. ROBERTS, ESQ.

4 Morgan, Lewis & Bockius, LLP

5 1111 Pennsylvania Avenue, N.W.

6 Washington, D.C. 20004

7

8 JASON E. GETTLEMAN, ESQ.

9 COREY R. HOUMAND, ESQ.

10 Morgan, Lewis & Bockius, LLP

11 1400 Page Mill Road

12 Palo Alto, CA 94304

13

14 DAVID J. LEVY, ESQ.

15 RICK L. RAMBO, ESQ.

16 THOMAS R. DAVIS, ESQ.

17 Morgan, Lewis & Bockius, LLP

18 1000 Louisiana Street, Suite 4000

19 Houston, TX 77002

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 BRENT A. HAWKINS, ESQ.

4 Morgan, Lewis & Bockus, LLP

5 One Market Spear Street Tower, 28th Floor

6 San Francisco, CA 94015

7

8 ZACHARY D. MILLER, ESQ.

9 Morgan, Lewis & Bockus, LLP

10 110 North Wacker Drive

11 Chicago, IL 60606

12

13 MATTHEW J. RIZZOLO, ESQ.

14 RYAN BRUNNER, ESQ.

15 Ropes & Gray LLP

16 2099 Pennsylvania Avenue, N.W.

17 Washington, D.C. 20006

18

19 KEVIN J. POST, ESQ.

20 LANCE W. SHAPIRO, ESQ.

21 Ropes & Gray LLP

22 1211 Avenue of the Americas

23 New York, New York 10036

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 SHONG YIN, ESQ.

4 Ropes & Gray LLP

5 1900 University Avenue, 6th Floor

6 East Palo Alto, CA 94303

7

8 For the Office of Unfair Import Investigations:

9 MARISSA DUCCA, ESQ.

10 JEFFREY HSU, ESQ.

11 U.S. International Trade Commission

12 500 E Street, S.W.

13 Washington, D.C. 20436

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 P R O C E E D I N G S

2 (9:00 a.m.)

3 JUDGE ELLIOT: Good morning. Please be seated.

4 All right. We're here in the matter of Certain
5 Video Capable Electronic Devices, Including Computers,
6 Streaming Devices, Televisions, and Components and Modules
7 Thereof, United States International Trade Commission
8 Investigation No. 337-TA-1380.

9 My name is Cameron Elliot, Presiding
10 Administrative Law Judge. May I have appearances from
11 counsel, please.

12 MR. SWAIN: Good morning, Your Honor. May I
13 approach?

14 JUDGE ELLIOT: Yes.

15 MR. SWAIN: Good morning, Your Honor. Adam Swain
16 from Alston & Bird on behalf of Complainants, Nokia. And
17 I'd like to introduce my team and some client
18 representatives, if you'd be so inclined.

19 JUDGE ELLIOT: I'm sorry, is that microphone on?
20 The one on the podium.

21 MR. SWAIN: Yes. It is very much on.

22 JUDGE ELLIOT: Okay. All right. I'm sorry. So
23 I didn't get the last thing. Tell me -- say it again.

24 MR. SWAIN: Okay. I'm happy to introduce my team
25 with me this morning, if you'd like.

Heritage Reporting Corporation
(202) 628-4888

1 JUDGE ELLIOT: Please do, yes.

2 MR. SWAIN: Thank you, Your Honor.

3 To my right is Mr. Warren Lipschitz from McKool
4 Smith; Ms. Jennifer Cieluch from Alston & Bird; of course a
5 familiar face, Mr. John Haynes, also of Alston & Bird.

6 And there's some additional members that will be
7 taking witnesses later in the case that you'll be hearing
8 from, including Mr. Mitch Verboncoeur from McKool Smith,
9 Ms. Lauren Simenauer, one of our NEXT advocates, from McKool
10 Smith as well; Mr. Ted Stevenson from Alston & Bird,
11 Mr. Josh Newcomer of McKool Smith; Mr. David Frist of Alston
12 & Bird; Mr. Nick Tsui of Alston & Bird. And I think -- I'm
13 sure I missed somebody. Mr. Mark McCarty, also of Alston &
14 Bird. He was hiding back there.

15 And there's a handful of client reps that have
16 come from far and wide and also close by to be here, Mr. Ron
17 Antush from Nokia, Mr. Todd Leitstein, Mr. Arvin Patel,
18 Dr. Clemens Heusch, and I believe Mr. Huw Edwards as well,
19 behind Dr. Heusch.

20 And that's our team that will be presenting over
21 the next week, Your Honor.

22 JUDGE ELLIOT: Very good. Good morning.

23 MS. ASCARRUNZ: Good morning, Your Honor.

24 Veronica Ascarrunz from the law firm of Perkins Coie on
25 behalf of the Amazon Respondents. And I'll introduce my

1 team as well. I'll introduce just the folks that will be
2 speaking and taking witnesses. Stefani Shanberg of Perkins
3 Coie, Tom Millikan of Perkins Coie, Robin Brewer, Andrew
4 Klein. Kyle Canavera is not in the courtroom, but he will
5 be speaking.

6 And we have co-counsel from the law firm of
7 Sheppard Mullin with us as well; Martin Bader and Ryan
8 Cunningham will be here later in the hearing. And we have a
9 client representative on behalf of Amazon, Charles Davis,
10 who will be here as well.

11 I also failed to mention one of our NEXT
12 advocates as well, Karl Johnston.

13 JUDGE ELLIOT: Very good.

14 MS. ROBERTS: Good morning, Your Honor.
15 Stephanie Roberts from Morgan Lewis on behalf of Respondent
16 HP, Inc. With me I have Rick Rambo, David Levy, Corey
17 Houmand, Jason Gettleman, Zach Miller, Brent Hawkins. We
18 also have co-counsel from Ropes & Gray, Kevin Post and Matt
19 Rizzolo. And with us, our client representative Tony Baca.

20 JUDGE ELLIOT: All right. Very good. Good
21 morning, everyone.

22 Oh, I'm sorry. Yes, go ahead.

23 MS. DUCCA: That's okay. Good morning, Your
24 Honor. Marissa Ducca from OUII. And with me today is David
25 Lloyd. And that's it for our team.

1 JUDGE ELLIOT: Very good. Good morning,
2 everyone.

3 Okay. So I am glad you worked out the issues
4 with -- I'm probably going to mispronounce --
5 Mr. Hannuksela, but that reduces my agenda this morning down
6 to just one item, which is getting the exhibits in.

7 And let me say that I reviewed the parties'
8 stipulation about how to handle exhibits. And, of course, I
9 encourage stipulations. It makes my job easier. But it was
10 unclear to me based on reading it that it was consistent
11 with how I usually do things. And I would rather do things
12 the way I usually do them, and what that means is the I'm
13 going to try to admit everything that's on your exhibit
14 lists now, okay?

15 If that's not how you want to do it, I'm sorry.

16 So I will hear objections, but there were quite a
17 few objections, especially from Respondents, about what was
18 on the exhibits and exhibit lists. And so I'm hoping that
19 most of the objections have already been resolved.

20 So let me start with Respondents. For what's
21 left over on Complainants' exhibit lists, or exhibit list,
22 that is admissible, by which I mean things that are not
23 offered just for impeachment, are there any objections?

24 MS. ASCARRUNZ: No, Your Honor. We've been able
25 to resolve all objections, again with the exception of what

1 you just mentioned, documents that have been identified
2 strictly for identification or impeachment purposes.

3 JUDGE ELLIOT: Excellent. Okay.

4 Mr. Swain?

5 MR. SWAIN: Same here, Your Honor, for
6 Complainants. No further objections. We worked them out
7 with Respondents.

8 JUDGE ELLIOT: All right. Very good.

9 Staff, anything to add?

10 MS. DUCCA: Staff has no objections.

11 JUDGE ELLIOT: Very well. So I will admit what's
12 on the parties exhibit lists, except for things that were on
13 there just for impeachment purposes or just for
14 identification purposes.

15 (Exhibits, as submitted by counsel and reflected
16 in the attached index, were received into evidence.)

17 JUDGE ELLIOT: My usual practice with
18 demonstratives is to admit them at the end because they tend
19 to change over the course of the case. So I will do that at
20 the end of the case.

21 Okay. I don't think I have anything else to talk
22 about. Is there anything the parties wanted to raise before
23 we get started?

24 Mr. Swain?

25 MR. SWAIN: Your Honor, one minor issue I wanted

1 to bring to your attention, we do have, as I mentioned in
2 the opening, that there is a NEXT advocate that we intend on
3 using, Ms. Simenauer, later today. I do realize Ground Rule
4 16 requires a submission to Your Honor a week before the
5 hearing. And as I understand, I don't think we made a
6 submission to that effect.

7 We talked it over with Respondents and Staff, and
8 they have no objection to having our NEXT advocate proceed.
9 So I wanted to make Your Honor aware of that and orally move
10 that we be allowed to present a NEXT advocate in this
11 investigation.

12 JUDGE ELLIOT: Well, that's fine. I prefer that
13 the parties flag ahead of time who you're going to or at
14 least that you have one or two NEXT advocates, but that's
15 fine. It sounds like both private parties have NEXT
16 advocates. So that's good.

17 So just a reminder, you get 15 minutes maximum
18 per NEXT advocate -- okay -- up to two. So, in other words,
19 you can max out at 30 minutes. If one of your NEXT
20 advocates does a 20-minute examination, only the first 15
21 minutes count. Okay?

22 All right. Very good.

23 MR. SWAIN: Thank you, Your Honor.

24 JUDGE ELLIOT: Anything else?

25 MR. SWAIN: Nothing further, Your Honor.

1 JUDGE ELLIOT: Very well. Thank you.

2 Ms. Ascarrunz, anything for Respondents?

3 MS. ASCARRUNZ: Nothing from Respondents, Your
4 Honor.

5 JUDGE ELLIOT: Very good.

6 MS. DUCCA: Nothing from Staff, Your Honor.

7 JUDGE ELLIOT: Very good. Okay.

8 Call your first witness.

9 MR. SWAIN: Your Honor, as Complainant Nokia's
10 first witness, we call Dr. Orchard.
11 Whereupon--

12 MICHAEL ORCHARD,
13 having been first duly sworn/affirmed, was examined and
14 testified as follows:

15 THE WITNESS: I do.

16 JUDGE ELLIOT: Have a seat.

17 MR. LIPSCHITZ: Your Honor, Warren Lipschitz for
18 Nokia. May I proceed?

19 JUDGE ELLIOT: Yes.

20 DIRECT EXAMINATION

21 BY MR. LIPSCHITZ:

22 Q. Good morning, Professor. Can you please state
23 your name for the record.

24 A. My name is Michael T. Orchard.

25 Q. Are you a Nokia employee?

1 A. No, I am not.

2 Q. What do you do, sir?

3 A. I'm a professor in the Department of Electrical
4 and Computer Engineering at Rice University.

5 Q. And why are you here today?

6 A. I'm here to give my opinions about the '991
7 patent.

8 Q. And can you give us a preview of your ultimate
9 conclusion?

10 A. My conclusion will be that -- or is that the '991
11 patent is infringed by the accused devices and is practiced
12 by the domestic industry products.

13 Q. Okay. Before we get into your opinions, let's
14 talk about your professional background. Can you tell us
15 about your education?

16 A. I received my Bachelor's at San Diego State
17 University and also got a Master's there. And then I went
18 on to Princeton for my Ph.D., and along the way to my Ph.D.,
19 I also got a Master's at Princeton too.

20 Q. And what industry experience do you have?

21 A. Before going for my Ph.D., right out of my
22 Bachelor's, I worked at Scientific Atlanta. And then as a
23 grad student at Princeton, I worked -- consulted with AT&T
24 Bell Labs, and after I got my Ph.D. I continued to do
25 consulting with AT&T Bell Labs. And I did work with NEC and

1 Flextronics.

2 Q. Okay. Were you in the Hunt for Red -- I'm sorry,
3 the Hunt for Red October?

4 A. I was not. I think this is here, though, because
5 in my first job at Scientific Atlanta, I was working on beam
6 forming and signal processing spectral analysis equipment,
7 and I built a good fraction of the boards that were in a
8 system called the BQR 23A, which is featured both in this
9 book and in the movie as the premier sensing machine that
10 was used to track down a renegade Russian submarine.

11 Q. How did you start working on video coding?

12 A. When I left Scientific Atlanta, I decided to go
13 back to school for my Ph.D. I was offered a scholarship at
14 Princeton, which I accepted. And it offered the opportunity
15 to work, first during the summers but then during the years
16 also, as -- along with any group at AT&T. And I decided to
17 work with Barry Haskell's group, which was their main group
18 in video communications.

19 Q. And how long have you been working on video
20 coding now?

21 A. Ever since then. I think that started in '87, so
22 I think that's 37 years.

23 Q. Okay. And what are we looking at here?

24 A. This is one of the submissions that I mad. This
25 was after I was actually -- I think I was at the University

1 of Illinois at the time -- or, no, I think maybe I was back
2 at Princeton again, teaching and doing consulting with --
3 with AT&T Bell Labs. And a group of us at AT&T Bell Labs
4 made a proposal to the H.26L standard development activity,
5 which was the precursor of the H.264 standardization effort.

6 Q. And have you taught video coding?

7 A. Yes, I do teach it and I have taught it.

8 Q. Okay. Can you tell us about your teaching
9 experience in video coding?

10 A. I introduced a class at the University of
11 Illinois that I think has continued to be taught for
12 undergraduates in image and video processing, which includes
13 compression, and I taught it at Princeton and still teach it
14 at Rice University.

15 Q. Okay. And can you tell us about recognition
16 you've received for your work on video coding?

17 A. I have various awards through my career, but the
18 most relevant to this case is, in January of 2000, I was
19 elected an IEEE fellow, and such fellowships are given with
20 citations for the accomplishment that's being honored. And
21 my citation read "for contributions to the theory and
22 development of image and video compression algorithms."

23 MR. LIPSCHITZ: Your Honor, Nokia offers
24 Dr. Orchard as an expert in the field of video coding.

25 JUDGE ELLIOT: Very well.

1 BY MR. LIPSCHITZ:

2 Q. Okay, sir, let's learn about the technology.
3 What's a video sequence?

4 A. A video sequence is just a sequence of images
5 that are meant to be displayed at regular time intervals,
6 fast enough so as to simulate a moving picture.

7 Q. Okay. And if we focus on just one frame, what's
8 a pixel?

9 A. A pixel is every light emitting dot of one of the
10 images of that sequence. And so in this picture, it will be
11 one of these dots that are shown.

12 Q. And how are pixels represented in video coding?

13 A. Generally, pixels are color, in most applications
14 we see today. And color is specified by its red, green, and
15 blue components, and each one of them is represented --
16 typically represented with an 8-bit word.

17 Q. And do pixels create a lot of data?

18 A. Absolutely. A tremendous number of data. In
19 fact, if you take a typical 4K display that is commonly sold
20 at BestBuy these days, then if you total the number of
21 pixels in any one of the frame and consider the fact that to
22 give -- render a very authentic-perceived video, motion, you
23 generally show 60 frames every second. If you multiply all
24 those numbers together, you conclude that you need 12
25 billion bits per second.

1 Q. For one second of video?

2 A. For one second, we need 12 billion bits.

3 Q. What is video coding?

4 A. Video coding has taken on the challenge of trying
5 to reduce that number when you have intention of sending a
6 video from one place to another.

7 Q. So what do we see here on CDX-4C.10?

8 A. On the left, we see the video encoder, which is
9 operating on some source of video, which has those 12
10 billion bits per second. The output is some presumably
11 lower number of bits per second, and how many bits actually
12 depend on the application, where it's being sent, if it's
13 sent -- what the target environment is.

14 But they're sent to some destination, which
15 reaches a video decoder, whose job is to take those bits,
16 decode them, and re-create the 12 billion bits per second in
17 order to show a video on this TV shown here.

18 Q. Let's go to 4C.11.

19 Now, in video coding, what terms do you use to
20 describe the parts of a video?

21 A. Well, kind of to talk about the logistics of
22 doing coding, we have to break things up and work on parts
23 at a time. So the first thing we do is we take the sequence
24 and break it up into image at a time.

25 Generally, those images are referred to in the

1 trade as frames or sometimes pictures. And then in the
2 coding of a frame at a time, generally we call the frame
3 working -- we are working on at a particular time as the
4 current frame.

5 And the current frame is broken up into blocks,
6 and those blocks are then coded one block at a time. And,
7 of course, within each block are the pixels of that block.
8 And so these are the components you see here.

9 Q. Okay. Let's go to 4C.12. Now, I see a lot of
10 the information in these two frames are the same. How can
11 an encoder take advantage of that?

12 A. Well, in order to have any possibility of meeting
13 this goal of reducing the 12 billion bits down to some
14 reasonable amount, we need to make use of the redundancy
15 between the information of the sequence. And so one type of
16 redundancy is the fact that the structure in a particular
17 block we might be working on is very similar or maybe even
18 identical to some structure of a block we've seen before.

19 So on the left is the previous frame, which
20 presumably at this point has already been decoded when we're
21 working on the current frame. And so we -- and for the
22 yellow block shown there, we would just tell the decoder go
23 ahead to the previous frame, if the scene that we're
24 addressing at the moment is a stationary scene, and just
25 copy what's there into this, into this location.

1 Q. Okay. And looking at 4C.13, how do you code part
2 of the frame that's moving like the door handle on this car?

3 A. So the yellow block there, which shows the door
4 handle, if we were to apply the rule that I just mentioned
5 in the last slide, we wouldn't get the door. I think we'd
6 get the front bumper or something like that over here. And
7 so that's not going to work.

8 But we can -- do see that there is another block
9 someplace in the scene that does provide a pretty good
10 approximation to the block that has the door handle in the
11 current scene. So we would go ahead and tell the decoder to
12 copy. Again, remember the entire image from the previous --
13 prior image is available to us. So we would just tell it to
14 copy that block into the position for the current image and
15 make that as a prediction.

16 But, of course, the -- there's extra information
17 that's needed, as the decoder needs to be told which block
18 to go get, and so that information of telling where to find
19 the block to copy is called a motion vector.

20 Q. Okay. Let's go to 4C.14. What do we see here?

21 A. Here we see really nothing more than what we saw
22 before, except instead of applying it to a cartoon sequence,
23 we're applying it to a real sequence of a jellyfish. On the
24 left is the prior frame that has already been encoded in the
25 coding of this jellyfish video. In the middle is the

1 current frame that we're working on at the moment. And on
2 the right is the result of doing what we just described.
3 For every block in the middle frame, we go and look in the
4 left-hand frame and look to see where can we find a block
5 that looks as close as possible, which is the
6 closest-looking block to the block that we want. And so
7 when we find that block, we move it into that position and
8 we create the position -- the block on the right.

9 Q. Okay. So let's zoom in on that current frame
10 prediction in 4C.15.

11 Why does it look like this?

12 A. Well, it looks like -- roughly like this because
13 this is the best -- because it's close to the content of
14 each of the blocks, but as you can see, it's messy. This is
15 not what the original -- what the real current frame looks
16 like. It looks like an ugly version of the current frame,
17 but it's the best we can do by just copying blocks from the
18 previous frame.

19 Q. Okay. And what do we see here on 4C.16?

20 A. Here I'm kind of representing what is bad about
21 the last frame. What I've done is I've taken the desired
22 current frame, the actual current frame that we would have
23 liked to have been able to show, and I'm subtracting off
24 that prediction that we created just by moving blocks. And
25 this is called the prediction error.

1 And just to reference what we're looking at here,
2 I've called zero. So when the difference is zero, I've made
3 that gray. Anything that is whiter, more white than gray,
4 means that a positive value should be added there to get the
5 current -- the right, the correct current frame. And
6 anything that is darker than gray, so more black than gray,
7 means that a negative value should be added.

8 Q. Okay. And so what does the encoder send to the
9 decoder to enable it to decode a frame?

10 A. Well, first, it sends the motion vectors. And,
11 as we said, with the motion vectors only and what the
12 decoder already has, we can create the image on the left,
13 which is the predicted image. And then it sends some
14 information that its best encoding, so the bits that allow
15 it to encode the thing that's on the right, which is some
16 approximation to the image we saw on the last slide.

17 Q. Okay. And what does the decoder do with this
18 information?

19 A. The decoder receives the motion vector and goes
20 ahead and creates the image on the left. It receives the
21 coded bits and decodes them and creates the coded prediction
22 error in the middle. And it adds the two together, and that
23 result of adding together is the decoded frame on the right.

24 Q. Okay. And why is that called the coded
25 prediction error in the middle there of 4C.18?

1 A. Because the prediction error we talked about
2 before is -- in general, would take a lot of bits to code
3 exactly correctly. And so what we do is we use coding
4 techniques to limit the number of bits and to get a close
5 approximation to that prediction error. And as general, the
6 theme of coding is that we recognize that the more bits
7 we're willing to spend, the more accurate we can expect
8 we'll be able to create that. But how many bits we can
9 spend will depend on the application, depend on the setting
10 and what our budget is of bits.

11 Q. Okay. And how was prediction error coded before
12 the '991 patent?

13 A. Before the '991 patent, the standard way of
14 coding prediction error was transform coding.

15 Q. Okay. Let's turn to 4C.19. What's a transform?

16 A. A transform can be thought of as like an artist's
17 palette, except in an artist palette, we allow the artist to
18 choose from among different colors. In the case of
19 transform, we're allowing him to choose from different
20 patterns. So what's shown in the center there is an array
21 of different patterns. Each one is a pattern the size of
22 the block that we're trying to create.

23 And the artist has the opportunity to look at
24 that palette and grab as much of any one of those as they
25 want and add it together with different amounts of other

1 ones. So, basically, he gets to choose how much of a
2 particular pattern to do. After choosing some collection of
3 those things, they add them together and they create a
4 result that goes on the canvas that's shown on the right,
5 which presumably is trying to approximate something.

6 Q. Okay. And why is this useful for video coding?

7 A. Because good transforms -- well, let's start by
8 just recognizing transforms have the property that -- any
9 image at all on the left. So on the left, I show a 16-by-16
10 pixel image. And the property of the transform is that any
11 image can be recovered by some combination of the patterns
12 in the palette.

13 But good transforms are designed so that they
14 can -- with only a few of -- the use of only a few of the
15 patterns, we can get a pretty good approximation to some
16 class of images, like prediction images, error images that
17 we might be interested in painting.

18 Q. Okay. And focusing on that image on the left
19 that's labeled the prediction error, why does it look like
20 that as opposed to, you know, why don't we see a car or
21 something?

22 A. Well, the reason is you've got to keep in mind
23 this is a 16-by-16 little snippet drawn out from an image.
24 Typical images might be a thousand by a thousand or more.
25 And so this is just a tiny little spot, and it's blown up

1 for us. We're not used to seeing things like that.

2 And it also is not the image itself. It's a
3 difference between an image and an approximation. So it
4 sort of looks somewhat obscure.

5 Q. Okay. And so looking at 4C.20, what are these
6 white numbers that we've added to the palette?

7 A. This is an artist has gone through and sort of
8 thought about what patterns could make a good approximation
9 of the left-hand side and come up with these numbers. And
10 so what these numbers mean is that he's proposing to
11 multiply the first pattern by minus 24, the pattern 2 over
12 to the right by minus 24, the next pattern over by minus 36,
13 the pattern below it by 34, et cetera, and after multiplying
14 each by those numbers, add them together and use that to
15 create the result which will be on the canvas on the right.

16 Q. And so what do we see on the right?

17 A. In this case, if we use those patterns,
18 multiplied by those numbers, we create the thing we see on
19 the right. And you'll notice that this is intended to be an
20 approximation to what's on the left. And I think it's
21 pretty evident that the thing on the right is not exactly
22 the same as the thing on the left, but it's a pretty darn
23 good approximation to it.

24 And the thing that's noteworthy about it is that
25 these -- either the image on the left or on the right have

1 256 pixel values that define them, but we created the
2 approximation on the right with only the 10 numbers that are
3 shown that multiply the palettes for the patterns from the
4 palette.

5 Q. Okay. Let's turn to 4C.22.

6 And what's different about this example?

7 A. Well, this is an example that's trying to
8 highlight the situation that the '991 patent addresses. And
9 it's a -- just imagine if the prediction error had looked
10 like that. This is -- the only different from the previous
11 prediction error we were considering was that here we've
12 added a large positive value, very white value, to one pixel
13 in this image.

14 And the observation that is known by all people
15 in the field is that that thing we added, which is just zero
16 everywhere plus a very large number at one location, is
17 really not at all related or not close or not correlated to
18 any of the patterns that we see in the palette. And because
19 of that, it's very hard for this set of this palette of
20 these patterns to re-create that image there.

21 Q. And can you really re-create that white dot in
22 the middle by weighting those patterns on the right?

23 A. Yes, you can. As I said earlier, one of the
24 properties of a transform is you create any image. And this
25 is an image; and, therefore, we know, we can be confident

1 that there is some collection of them that does create that
2 image on the left.

3 However, that collection -- the combination of
4 them that creates that is going to include a lot of the
5 patterns, so a lot of numbers that are going to be needed to
6 specify how we add them together.

7 And the disturbing part about that is that all
8 these numbers would be needed to create something that you
9 can kind of intuitively say is really characterized by one
10 number, which is the value of how big that dot is. And so
11 we're kind of putting ourselves in the position of using
12 lots of numbers to represent one number, which isn't good in
13 coding.

14 Q. Okay. And so what does that one dot mean for the
15 amount of data that the encoder has to send the decoder?

16 A. In transform coding, it means that we have to
17 send a lot of data because we have to send a lot of numbers
18 and we have to send bits for each of the numbers.

19 Q. Okay. What do we see in this example?

20 A. This is just another example of that, which is
21 commonly -- which typifies things that are commonly found.
22 And I don't mean to say it's exactly that cross, but it's
23 very typical to not just have dots but to have clusters of
24 dots localized together. And this is an example of that.

25 Q. Okay. Let's look at the '991 patent.

1 And can we please pull up JX-10, the cover, and
2 focus on the top left.

3 What's the title of the patent?

4 A. The patent is entitled "Spatially Enhanced
5 Transform Coding."

6 Q. Okay. And who is the inventor?

7 A. Jani Lainema.

8 Q. And what was the provisional application filing
9 date?

10 A. It was filed on April 12th, 2007.

11 Q. And when is that in relation to when the H.265
12 standardization began?

13 A. This is at least several years before even the
14 very beginning of the standardization of H.265.

15 Q. Okay. Let's pull up column 2, 25 to 38. Now,
16 what do the inventors tell us about the problem they were
17 trying to solve?

18 A. Well, in this section, they kind of set up the
19 same thing that we have been talking about. They note that
20 transform coding has typically been used for sending
21 prediction error. But they note that the transform can
22 efficiently pack energy of the prediction error signal only
23 under certain statistics, and the coding performance
24 deteriorates when the prediction error to be transformed
25 becomes less correlated.

1 This is exactly the situation that applies to
2 that image with the dot.

3 Q. Okay. And let's go to 36.12.

4 What do the inventors tell us about where these
5 types of errors occur?

6 A. They say here that the errors that are not
7 correlated with the patterns in the palette can be found in
8 certain types of sensor noise. And I'll make a point that
9 many sensor noise generate prediction errors that are -- or
10 signals that are -- that have -- are similar to the dot that
11 we saw in our example there. And then high-frequency
12 texture and edge information also have structures that also
13 are problematic for transform coding.

14 Q. Okay. Let's go to 2.64 to 3.2, please.

15 And what's the solution that the inventors
16 identified?

17 A. The inventors propose that the prediction error
18 signal for a single image block is constructed using
19 transform basis functions and spatial samples, i.e., pixel
20 values. In other words, they propose that we don't just
21 limit ourselves to representing the prediction error with
22 transform patterns, but, rather, a combination of patterns
23 and spatial samples.

24 Q. "Spatial sample," that's a new term. Can you
25 please explain to us the difference between transform

1 coefficients sent in the bitstream and spatial samples?

2 A. So a transform coefficient is specifying how much
3 of a particular pattern to use in creating the prediction
4 error. And the pattern, of course, adds some value to all
5 the pixels in the entire block. A spatial sample is a value
6 that's specifying something to add to one spatial location
7 or pixel location inside the block.

8 Q. Let's go to slide 4C.24, please. Thank you.

9 Now, using this example, can you please explain
10 to us the proposed solution?

11 A. So here I'm sort of -- giving an example, which
12 is the example we considered earlier on the right side. And
13 we're talking about how we would propose to code that image
14 that we said is problematic for transforms. And what the
15 '991 suggests is we break it up into two pieces and add
16 them. And the first piece on the left is everybody --
17 everything except for the dot in the middle.

18 And, as we saw earlier, is efficiently
19 represented with just some hopefully limited number of
20 transform coefficients.

21 And then to that we add another image size thing
22 which is zero everywhere, except for in this case one spot,
23 which has a spatial sample. But in general for other
24 examples, it might be a couple of spots which are specified
25 by the values of particular samples. Then we add them

1 together to be the representation that we use.

2 Q. And do the inventors provide examples on how to
3 do this?

4 A. Yes, they do, in the specification.

5 Q. Let's pull up the '991 patent at 5, 51 to 65.
6 And if we could, let's put Figure 2 next to it. Thank you.

7 What do we see in Figure 2(a)?

8 A. In Figure 2(a) is a one-dimensional example
9 that's sort of analogous to the example that we talked
10 about. It's an example that has -- in this case, the block
11 that we talked about in our examples is replaced with just
12 four numbers in one dimension across.

13 And this is -- consists of just four ones
14 straight across, except with one of them, there's what it
15 calls an outlier. The 3 is an outlier. And so that outlier
16 kind of plays the role of our dot in the middle of our
17 picture.

18 Q. Okay. And show us how this was addressed before
19 the '991 patent in Figure 2(b).

20 A. In 2(b), it shows that, in fact -- so remember in
21 one dimension, one of those patterns is just going to be
22 some collection of four numbers since the block here is just
23 four numbers. And so there are four different such patterns
24 shown in that mess that's shown there.

25 But what this is confirming is that there is a

1 way to scale and add those four different transform palette
2 patterns in such a way that when you add them up, you get
3 exactly the figure -- or the signal in 2(a) that we're
4 trying to code.

5 Q. Okay. And how do the inventors modify the
6 approach for Figure 2 (c)?

7 A. In 2 (c), the suggestion is let's not use all the
8 transform coefficients or transform patterns but just use
9 one pattern, which is 111 across, and scale it appropriately
10 to cover the values that are kind of the same there, and
11 then to the one location, which is location 3, I guess, you
12 add a spatial sample to get it to match the -- the outlier.

13 Q. Okay. And let's go to column 4, 53 to 58.

14 What do the inventors explain is the benefit for
15 this example?

16 A. It identifies, I think, pretty simply what the
17 benefit is, that instead of using four transform
18 coefficients that were used in 2(b), we get away with just
19 sending a single transform coefficient and a single spatial
20 sample. So we get away with sending two numbers instead of
21 four numbers.

22 Q. Okay. And I understand you created a diagram
23 we're going to use today which depicts what you just showed
24 us in the patent.

25 A. Yes.

1 Q. Can we just pull up 4C.25.

2 And what do we see on the far left here?

3 A. On the far left, we see the incoming bits. And
4 that's the coded prediction error signal. It's the bits
5 that are used to encode the prediction error signal that
6 we've seen.

7 Q. Okay. And what's the first thing that happens in
8 the decoder?

9 A. The first thing is we take those bits and we turn
10 them into two types of numbers, two types of parameters.
11 One type is the transform coefficients needed to fuel or to
12 enable the transform part of the representation you saw in
13 the last slide. And the other are the spatial samples that
14 are needed to fuel or to inform the content of the spatial
15 information that we saw on the last slide.

16 Q. Okay. So focusing on the transform coefficients
17 at the top, how do those numbers there relate to the white
18 numbers on the palette that you showed us?

19 A. The white numbers that were added indicated how
20 much of a particular pattern to use in adding together the
21 various pattern elements to make the approximation. In this
22 case, 27 is a number we would multiply by one pattern; 2 is
23 a number we would multiply by another pattern; 8, et cetera.

24 And we would then -- so they specify how we would
25 create the mixture or the recipe for mixing the patterns

1 together to create the approximation that would be the
2 transform part of the signal.

3 Q. Okay. And below that, we see the spatial
4 samples. What are the numbers below the spatial samples?

5 A. The numbers below the spatial samples are
6 basically the brightness of several white spots. In our
7 example, we just -- you simplify things to have just a
8 single white spot, but typically we can have several white
9 spots. So this would be different white spots with
10 different level of whiteness, 21, 34, and 89. And they
11 specify the values of those samples.

12 Q. Okay. And can we add up the transform
13 coefficient numbers there and the spatial samples to create
14 a block of pixels?

15 A. No, we couldn't. In fact, regardless of what we
16 would create, we couldn't even know what it means to add up
17 nine numbers shown on the top with three numbers on the
18 bottom. It's not clear what it means to add them up.

19 And, moreover, on top of that, they're not the
20 same things. It would be like if we tried to add them up,
21 we would be adding apples and oranges. They're not
22 representing the same thing.

23 Q. Okay. And so what do you need to do to make them
24 usable?

25 A. To make them usable, we need to decode each one

1 of them into the images that we saw in the previous slide
2 that are the set of pixels that each of them represents.

3 Q. Okay. And what are the components added on the
4 right side to create the decoded block?

5 A. Well, across from the transform coefficients is
6 what we call the transform information. And that's the
7 block of pixels that is the result of the artist putting
8 together the various patterns and creating the sum of them
9 into -- to be the approximation of the signal on the right
10 --

11 Q. And so --

12 A. -- on the left in our picture.

13 Q. I'm sorry. And so what's the difference between
14 the transform coefficients and the transform information
15 shown here?

16 A. The transform information, that list of things,
17 are actual pixel values for every pixel in the block. Those
18 pixel values are what they are because of the sum of the
19 patterns that those numbers on the left represent, but the
20 numbers on the left are amount of patterns; the numbers on
21 the right are actual. The pixel values after you add the
22 things up.

23 Q. Okay. And then what's the difference between the
24 spatial samples and the spatial information?

25 A. Well, again, the spatial samples is just three

1 numbers. The spatial information is something of size,
2 which is the size of the block. And it is -- uses the
3 spatial sample values to create that block, but it is the
4 block that is going to be added. It's appropriately sized.
5 And each of those are a pixel value for every pixel in the
6 block.

7 Q. Okay. So according to the '99 -- sorry, the '991
8 patent, what are the three components we add together to get
9 the decoded block of pixels?

10 A. We start with the prediction on the top. That
11 would be, let's say, the motion compensated prediction that
12 we talked about earlier. We then add the transform
13 information, and then we add the spatial information. And
14 together when we add them all up, we get the decoded block.

15 Q. Okay. Now, let's go to 4C.26.

16 And using this framework, what happens if you
17 have multiple pixels in the spatial information that are the
18 same? So you can see here on the spatial information, we've
19 got three 21s. How would that be coded?

20 A. Well, in a straightforward way, each of them
21 would be a spatial sample. A list of spatial samples would
22 be all of the values that are not zero. And so the list
23 would include 21, 21, 21, 34, and 89.

24 Q. Okay. And do the inventors suggest a more
25 efficient way to handle this particular situation?

1 A. Yes, they do.

2 Q. Let's pull up the '991 patent at 6, 37 to 39.
3 What do they explain?

4 A. They explain that when the opportunity is
5 available, that a number of the spatial samples can be coded
6 and decoded as one unit. For example, representing certain
7 patterns or textures.

8 Q. Okay. Let's go back to the slides.

9 Okay. So focusing on the spatial samples here,
10 how many 21s do we have?

11 A. So this is the result of applying that teaching
12 from the '991 patent and we have decoded -- we have decoded
13 the three 21s that had been there as one unit. And we show
14 it as only one 21.

15 Q. So one 21 in the spatial samples. And how many
16 in the spatial information?

17 A. Three of them.

18 Q. Okay. So what is the feature in the accused
19 products that infringes the '991 patent?

20 A. It's called Sample Adaptive Offset.

21 Q. Okay. In what standard is that contained?

22 A. It's in the H.265 standard.

23 Q. Let's look at an example. What do we see here on
24 the right of slide 4C.29?

25 A. On the right, we see the result of coding a

1 sequence with the H.265 standard but with Sample Adaptive
2 Offset functionality disabled. So it's not used.

3 Q. Okay. And what are all those little things that
4 we see around the letters there on the word on the right,
5 around like the K, for example?

6 A. They're artifacts localized, little, almost
7 point-wise artifacts, similar to the example that we looked
8 at before.

9 Q. Okay. And what do we see on the left?

10 A. We see the same H.265 standard coding the same
11 material but this time with Sample Adaptive Offset function
12 enabled.

13 Q. Okay. Now, focusing again on that word on the
14 right with all the artifacts, do the transforms do a good
15 job of addressing these types of artifacts?

16 A. No, they don't because I said the one on the
17 right is decoding that with Sample Adaptive Offset disabled.
18 And when Sample Adaptive Offset is disabled, the result is
19 actually using transforms. So with the use of transforms,
20 they are still there.

21 Q. Okay. So if transforms don't do a good job at
22 addressing these types of artifacts, what does?

23 A. Sample Adaptive Offset.

24 Q. Okay. Did you see any papers that described the
25 benefits of Sample Adaptive Offset?

1 A. Yes, I do. I think the next slide.

2 Q. Okay. Let's go to 4C.30. What does this paper
3 tell us about the benefit?

4 A. This describes Sample Adaptive Offset in the
5 H.265 standard, and it is authored by people who made --
6 including some of the people who made the proposal to
7 include SAO in the H.265 standard. And they report the
8 results of tests they have done that say that they produce
9 an average bit rate reduction of 3.5 percent, and for
10 certain videos having certain characteristics, it can be as
11 much as a 23.5 bit rate reduction they've noted.

12 Q. Okay. So does that mean for a given video
13 quality, SAO, Sample Adaptive Offset, will reduce the size
14 of the bitstream by 3.5 percent on average and up to
15 23.5 percent?

16 A. Yes, generally, it does. The BD rate reduction
17 is actually the average of several different quality levels.
18 So it's what you said but averaged over different quality
19 levels.

20 Q. Okay. And if we look at the quote on the bottom
21 there, what does it say about the ability of Sample Adaptive
22 Offset to correct these type of errors?

23 A. It says that SAO significantly improves the
24 visual quality by suppressing the ringing artifacts near
25 true edges.

1 Q. Okay. Let's go to 4C.31. Now, this is the
2 figure on the first page of the paper.

3 Does this architecture show evidence of the
4 teachings of the '991 patent?

5 A. Yes, it does. This is the block diagram used by
6 the authors of that paper to illustrate H.265. And it
7 includes -- you could recognize within it exactly the
8 teachings of the '991 patent. If we go to the next slide,
9 we can highlight those parts.

10 The variables that are read out called Sample
11 Adaptive Offset information are the spatial samples that we
12 talked about. And the things that are inverse-coded with
13 the inverse transform and inverse quantization are the
14 transform information that is created. So after the inverse
15 transform, that creates the transform information. And on
16 the left side, that block generates predictions.

17 And, basically, it shows the addition of
18 predictions, transform, and spatial information to create
19 the result.

20 Q. Okay. So let's see what was changed for H.265.
21 How did this work in H.264?

22 A. Well, this is the prior art decoding like H.264,
23 and it's superimposed on the same structure similar to the
24 block diagram we talked about before. So coming out of the
25 entropy decoding, for the prior art we would only decode

1 transform coefficients. Those transform coefficients would
2 be decoded in the yellow section that is shown there.

3 On the left, there would be prediction taking
4 place, which provide a prediction in blue. The two of those
5 would be added together and create the result in green,
6 which goes through a deblocking filter and produces the
7 output image.

8 Q. Okay. Let's go the 4C.34.

9 What did H.265 add?

10 A. Well, as you can see, H.265 maintained the yellow
11 part, the blue part, but it added a purple part. The purple
12 part is another set of variables sent by the -- coded over
13 the stream and they represent spatial samples. And those
14 spatial samples are decoded into an image which is suitable
15 for adding with the green result, and the green result added
16 to the purple result gives the decoded image.

17 Q. Okay. Now, you mentioned the deblocking filter
18 shown there kind of towards the bottom right. What's a
19 deblocking filter?

20 A. A deblocking filter is a filter that is expressly
21 -- the purpose of it is to try to reduce the artifacts
22 between different blocks in the image that's being decoded.

23 Q. Does the '991 patent contemplate using a
24 deblocking filter?

25 A. The '991 patent does contemplate using the

1 deblocking filter. It has a section which, in fact,
2 suggests that deblocking filters can be used for -- can be
3 applied to either the prediction or the prediction error or
4 any combination of the two. And so this would be one
5 particular combination of the two.

6 Q. And why didn't you include the deblocking filter
7 in the diagram you showed us for the '991 patent?

8 A. Well, it's my opinion, first, that the deblocking
9 filter is an optional filter in the standard. And as an
10 optional filter, there are many pixels that are in blocks
11 that do not -- are not affected in any way by the deblocking
12 filter, meaning that the deblocking filter does nothing to
13 change the values for those pixels, and so that many times
14 it's not being used.

15 And even in those cases where it is being used,
16 since it is taught as part of the invention, I believe a
17 person of ordinary skill in the art would understand that
18 the sum of the prediction and the transform information,
19 when the deblocking filter is applied to make it look nicer,
20 is still a sum of a prediction and transform information.

21 And so for that reason, in the block diagram we
22 saw and for all the rest of the block diagrams in this -- in
23 my testimony here, I'm going to be leaving that out.

24 Q. Okay. Let's turn to your infringement analysis,
25 4C.37.

1 What are the primary sources of evidence that you
2 considered?

3 A. We considered the -- or I considered the H.265
4 standard, because the devices being accused practice or
5 comply with the H.265 standard. So we -- I analyzed the
6 activities that must be present by virtue of the fact
7 they're complying with the H.265 standard.

8 I also looked at the source code shown on the
9 upper right hand side, I show an example of just generic
10 source code. But by analyzing the source code, I, in fact,
11 confirmed that the accused devices do contain those portions
12 that would be suggested or required by the H.265 standard.

13 And, finally, I used testing analysis of the
14 actual videos that were decoded successfully on the accused
15 devices. And that testing analysis tracked through the
16 process of decoding those videos and confirmed that in the
17 decoding of them, the accused functionality that was -- is
18 identified in the H.265 standard is actually present and is
19 accessed and is used in the decoding.

20 Q. Okay. Let's go to 4C.38.

21 Is there any dispute over the definition of a
22 person of ordinary skill in the art?

23 A. These are the two definitions that have been
24 offered. And to my understanding, there's not any
25 significant difference.

1 Q. Okay. And do you satisfy both definitions?

2 A. Yes, I do.

3 Q. And did you apply them in your analysis?

4 A. Absolutely.

5 Q. Okay. Let's go the 4C.39.

6 What are the accused products?

7 A. The accused products are HP laptops and desktops,
8 and for Amazon, they're tablets, TVs, and media players.

9 Q. Okay. And what are the domestic industry
10 products?

11 A. For Microsoft, they are various Surface devices
12 and the Xbox.

13 Q. Okay. And --

14 A. Oh, pardon me. And for Samsung, they're Galaxy
15 phones.

16 Q. And do all of these devices that are shown here,
17 the accused domestic industry products, do they all support
18 H.265 decoding?

19 A. They do. And they all practice Sample Adaptive
20 Offset, and they all -- I will conclude that they all
21 infringe the '991 patent or practice the '991 patent.

22 MR. LIPSCHITZ: Your Honor, at this point, we're
23 going to be getting into Respondents' CBI, so I'd request
24 that we seal the courtroom with respect to the Nokia
25 representatives.

1 JUDGE ELLIOT: Very well.

2 (Whereupon, the hearing proceeded in confidential
3 session.)

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 BY MR. LIPSCHITZ:

3 Q. Let's go to 4C.54, claim elements 22[b] and
4 31[c].

5 Now, first, can you show us how you updated your
6 diagram?

7 A. Well, based on the discussion of the last
8 element, I replaced the kind of figurative things underneath
9 transform coefficients and spatial samples by the actual
10 variables in the H.265 standard that represent the transform
11 coefficients in that standard and the spatial samples in
12 that standard.

13 Q. Okay. And how does this claim limitation map to
14 your diagram?

15 A. So this claim limitation we're looking at now
16 relates to the yellow highlighted part of the diagram, the
17 decoding of the transform coefficients into transform
18 information.

19 Q. Let's go to 4C.55.

20 So we have to show transform coefficients being
21 decoded into decoded transform information. So where are
22 the transform coefficients?

23 A. Well, on the left is a copy of that equation that
24 was at the bottom of the other slide, and it shows how the
25 transform coefficients are put together from the various

1 pieces that represent it. So that's what -- the transform
2 coefficients that we start with.

3 Q. Okay. And where are they decoded?

4 A. Well, as is shown on the right and the top
5 yellowed-out section, they are sent to what's called clause
6 8.6.2. That is a function that describes -- that performs
7 some function on those transform coefficients, and that
8 function is that it performs the scaling and transformation
9 process that is involved with creating the results from
10 mixing together the appropriate parts of the different
11 patterns in the palette.

12 So that's doing transformation. And it produces
13 a result, which is called transform block there, is the
14 output of that.

15 Q. Okay. And so where is the transform information?

16 A. The transform information for the block is
17 transform block, but that is -- all the transform blocks for
18 each of the individual blocks are pieced together to create
19 this result that's on the bottom called resSamples. So
20 resSamples is an image worth of transform information.

21 Q. And how do we know it's transform information?

22 A. Well, we know it's transform information because
23 it is the result of doing the inverse transform of the -- or
24 applying the transform and creating the pixel values. And
25 so the transform -- each of the transform blocks are pixel

1 values created by these coefficients. And, therefore, the
2 image is full of pixel values that are created by the
3 transform.

4 Q. And do all of the accused and domestic industry
5 products practice claim limitations 22[b] and 31[c]?

6 A. Yes, they do.

7 Q. Let's go to 4C.56.

8 And, first, can you show us how you updated your
9 diagram?

10 A. Well, here, based on the last element we replaced
11 transform information with the image that we saw holds the
12 actual pixel values that are the transform information. And
13 it is -- the resSamples is the name of that array.

14 Q. And can you please map this claim limitation to
15 your diagram?

16 A. Well, this claim is "the decoding by a processor
17 of a plurality of spatial samples into decoded spatial
18 information." So that pertains to the yellow highlighted
19 section of the block diagram there.

20 Q. Okay. Let's go to 4C.57.

21 We have to show spatial samples decoded into
22 decoded spatial information.

23 Where the spatial samples?

24 A. The spatial samples are in the array that we saw
25 earlier. It had four values in it, called SaoOffsetVal.

1 Actually, you'll see in this one that the index there is
2 shown as I plus 1, and the reason for that is the four
3 values that are read are placed in the -- in four positions,
4 shifted over by one, so that the first position can be
5 reserved for the number 0. So the SaoOffsetValue actually
6 has five positions in it, the four spatial offsets that were
7 read, plus the zero.

8 Q. And where are they decoded?

9 A. They're decoded down below in the section that's
10 highlighted, and you'll see that the second highlight shows
11 that something is created that is added to recPicture.
12 We'll see that recPicture -- coming up, we will see that
13 recPicture is the sum of already of the predicted picture
14 and the transform information. And to that we then add
15 this, which is the spatial information.

16 And you'll notice that the values are all coming
17 from one of those five values, but they're indexed by
18 bandIdx. And bandIdx is a value which is a function of xSi
19 and ySj. You see them there on the bottom line. And xSi
20 and xSj (sic) is the position -- every position in the
21 block.

22 So, basically, every position in the block has
23 its own value of that index. And that serves for creating a
24 block, which is the size of the block at which values from
25 one of these five values is at every position.

1 Q. Okay. So do all of the accused and domestic
2 industry products practice claim limitations 22[c] and
3 31[b]?

4 A. Yes, they do.

5 Q. Okay. Let's go to 4C.58. This is the last
6 limitations of the independent claim, 22[d] and 31[e].

7 First, how did you update your diagram?

8 A. I updated it by replacing the spatial information
9 with the variable -- with the array or the block that
10 represents that spatial information, which is
11 SaoOffsetValue, but indexed by bandIdx, which makes it an
12 image or box-size array of values all coming from the
13 spatial samples.

14 Q. Okay. And can you please map this claim
15 limitation to your diagram?

16 A. In this one, we are adding by a processor the
17 decoded transform information, the decoded spatial
18 information, and a reconstructed prediction of the block of
19 data, thereby forming a decoded representation of the block
20 of data. So all of that, the addition of those three items
21 thereby creating a representation is -- associates with the
22 highlighted yellow section to the right.

23 Q. Okay. So let's go to 4C.59. So we have to add
24 the transform information, the spatial information, and the
25 prediction to get the decoded block, three components.

1 So, first, where is the spatial information?

2 A. So what's shown there is how the spatial
3 information, which we had talked about, what, two slides or
4 three slides ago, is SaoOffsetValue, indexed by bandIdx, is
5 added here to recPicture.

6 And we're going to see, coming up, that
7 recPicture is already the sum of the predicted block and the
8 transform information. And it produces something called
9 SaoPicture. And since this already now is the sum of
10 spatial information and transform information and predictive
11 block, this SaoPicture is the decoded representation of the
12 data.

13 Q. Okay. So can you show us these variables are
14 what you say they are in the following slides?

15 A. Yes.

16 Q. Okay. Now, where does this show us on 4C.60 that
17 the predSamples you pointed to are the prediction block?

18 A. Well, there are several types of prediction that
19 are supported by H.265. And I just show one example of the
20 intra-prediction. And the result of the intra-prediction
21 function here or process here is the output specified on the
22 bottom, and it says that that output is an array called
23 predSamples, which is the samples I referred to earlier.

24 There are other sections for other types of
25 predictions. All of them have the common output. They all

1 name the output that they create, predSamples because that's
2 the array holding predictions.

3 Q. Let's go to 4C.61.

4 Where does this show us that the predicted block
5 of pixels are added to the transform information?

6 A. Well, on the bottom red or yellow highlight
7 there, we see that predSamples is added to resSamples. And
8 if you remember back -- it has been quite a few slides
9 already -- but we had concluded that our transform
10 information was called resSamples. And that -- at this
11 point, we're adding it to what we just saw is the
12 predSamples, which is the predicted block, creating on the
13 left-hand side, I guess, the name of that is called
14 recSamples.

15 And just from what we're seeing here, we know
16 that that is the sum of the predicted block, plus the
17 transform information.

18 Q. Okay. So you showed us earlier that the spatial
19 information, SaoOffsetVal is added to something called
20 recPicture. How does recPicture relate to recSamples?

21 A. Well, first, looking up, you'll notice that
22 recSamples is also called S of L, the reconstructed picture
23 sample array. If you look to the section that calls the
24 process that does the Sample Adaptive Offset, you'll notice
25 that it sends to the Sample Adaptive Offset function this

1 array, recSample.

2 And then if you look at the header to that Sample
3 Adaptive Offset function, you'll see that it calls the input
4 that it receives -- it gives it the name recPicture. So the
5 recPicture inside the Sample Adaptive Offset function, the
6 thing it calls recPicture is SL or is recSamples.

7 Q. Okay. Let's go to 4C.62.

8 And can you show us how you finish your block
9 diagram?

10 A. So here on the right-hand side, I've shown that
11 the prediction is the predSample. We already saw that the
12 transform information is recSample. We saw that the spatial
13 information is SaoOffsetVal indexed by bandIdx. And so when
14 we add them all together, we get the value that we saw in
15 the equation a few slides back, SaoPicture. So this is
16 given now a name from H.265 for all of the components of
17 this block diagram.

18 Q. Okay. Let's go to 4C.63. And let's address
19 another of Respondents' non-infringement arguments. Now,
20 Respondents say that the spatial samples are not part of the
21 prediction error; they're separate. Do you agree with that?

22 A. I do not agree with that.

23 Q. Okay. How do we know that the spatial samples
24 are part of the prediction error?

25 A. We know it because the prediction error is the

1 difference between the ultimately decoded block and the
2 block that was predicted, because the prediction error is
3 the error of the prediction in the ultimate block that's
4 decoded.

5 Simple algebra tells us, if we want to know what
6 was added to the prediction to create the decoded block, you
7 subtract from the blue the yellow here. And if you subtract
8 from the decoded block, the prediction block, you're left
9 with the other two components that are shown there, the
10 transform information and the spatial information. So the
11 prediction error is the sum of the transform information and
12 the spatial information, and thus the spatial information is
13 certainly part of the prediction error.

14 Q. Okay. Sir, in your opinion, do the Respondents
15 infringe claims 22 and 31?

16 A. Yes, they do.

17 Q. And do the domestic industry products practice
18 claims 22 and 31?

19 A. Yes, they do.

20 Q. Okay. Let's go to 4C.64. Let's turn to the
21 dependent claims, 29 and 38, the only dependent claims
22 asserted.

23 And back to your diagram, can you explain how
24 these claims relate to your diagram?

25 A. Well, first, to start with, I just -- actually, I

1 think this is the original copy of this structure that we
2 saw when we first introduced this structure showing the
3 teachings of the '991 patent.

4 And this particular claim addresses a particular
5 situation, so if we were to look at the next slide, this is
6 the situation that it's addressing. It's addressing times
7 when there is an opportunity where some of the plurality of
8 spatial samples can be decoded as a single unit.

9 So if we look at the spatial samples here, we see
10 there are three 21s and we see there's an opportunity to
11 code them as a single unit. And so this is teaching that,
12 instead of sending what is shown right there, we would send
13 what's shown here, which is that the three 21s would be
14 coded as a single unit, as a single 21.

15 And you'll notice that the result of using this
16 element of claim 29 is that we represent the same thing on
17 the right, the same spatial information with the same three
18 21s, but now with only a single unit 21 representing those.

19 Q. Okay. And let's go to 4C.68.

20 So focusing on the top left, what is
21 SaoOffsetVal?

22 A. Remember that the spatial information is
23 SaoOffsetVal indexed by band index. So SaoOffsetVal is the
24 original array of the five elements. We said the first one
25 is zero, and here I filled in the other four by some example

1 numbers, but these are numbers that we'll be reading or
2 receiving from the coded bitstream.

3 Q. And what do the highlighted 3s represent on the
4 left?

5 A. Well, they are elements of band index. And you
6 remember band index is the index that we give to SaoOffset.
7 And so, basically, what it means is that when we do band --
8 SaoOffset of band index, we assign to each of the positions
9 shown in band index that element of SaoOffsetVal, which is
10 pointed to by the number in band index.

11 So, for example, every time it's zero, there we
12 give the zero element. In SaoOffsetVal, the convention is
13 to count them by 0, 1, 2, 3, 4. And so the zero element is
14 the zero. The three 3s there mean that in each of those
15 locations, we put the third element, which is 0, 12, 38, 16.
16 So it's the 16 that goes there.

17 And so the net result on the right, you see where
18 SA0 Offset is indexed by bandIdx. You have an image full of
19 values from SaoOffsetVal, but the particular value that
20 shows up at a particular location relates to the index
21 that's shown in bandIdx.

22 Q. Okay. Sir, in your opinion, do the accused
23 products infringe claims 29 and 38?

24 A. Yes, they do.

25 Q. And in your opinion, do the domestic industry

1 products practice claims 29 and 38?

2 A. Yes, they do.

3 Q. Now let's go to 4C.70.

4 Can you explain the representative products
5 stipulation for HP?

6 A. HP provided stipulations that their products fall
7 into groups of the GPUs that are used in them, and there are
8 12 different representative groups of GPU chips and 13
9 representative groups of CPU chips.

10 Q. Okay.

11 MR. LIPSCHITZ: And Your Honor, at this time, we
12 have to briefly seal the courtroom again.

13 JUDGE ELLIOT: Very well.

14 MR. LIPSCHITZ: Thank you. And this is going to
15 be third-party CBI. So Respondents and Nokia will need to
16 be sealed.

17 JUDGE ELLIOT: Very well.

18 (Whereupon, the hearing proceeded in confidential
19 session.)

20

21

22

23

24

25

1 O P E N S E S S I O N

2 CROSS-EXAMINATION

3 MR. MILLIKAN: Tom Millikan for Respondents.

4 BY MR. MILLIKAN:

5 Q. Good morning, Dr. Orchard.

6 A. Good morning.

7 Q. It has been a little while.

8 A. I imagine, yeah.

9 Q. During your presentation in the '991 patent, you
10 showed a few excerpts, right?

11 A. A few excerpts?

12 Q. You showed a few excerpts of the '991 patent,
13 right?

14 A. Oh, yes. Yes.

15 Q. You brought them up on the slide and excerpted a
16 few pieces of text from the patent, right?

17 A. Right, yeah.

18 Q. But there are nine figures in the '991 patent,
19 right?

20 A. Yes, there are.

21 Q. Okay. You only showed Figure 2. Is that right?

22 A. Yes, I only used it for illustrations of my
23 points here.

24 Q. You didn't -- and the only figure you showed,
25 Figure 2, you actually consider a toy figure, right?

Heritage Reporting Corporation
(202) 628-4888

1 A. I think of that as a toy figure, yes.

2 Q. So you only focused on the toy figure and you
3 excluded showing all of the other figures, right?

4 A. We had limited time, so, yeah. I thought that
5 was the most efficient way of making the points I was
6 making, yeah.

7 Q. Okay. We'll come back to those figures in a
8 little bit. This case is also about standards and standards
9 documents, right?

10 A. Yes.

11 Q. You didn't show any of Nokia's submissions to the
12 ITU related to the '991 patent, right?

13 A. That's correct.

14 Q. You reviewed those submissions, right?

15 A. Sorry?

16 Q. You reviewed the submissions to the -- to the ITU
17 related to the SA0, right?

18 A. Yes, I did.

19 Q. And you didn't cite any of those in your report,
20 right?

21 A. I did not, no.

22 Q. And that's because Mr. Lainema was not involved
23 in the development of SA0 at the ITU, right?

24 A. Dr. Lainema was not involved in the proposal of
25 SA0. I think via the '991 he was involved in some of the

1 technologies that are in the SA0, but no, he did not -- was
2 not involved in the proposing of the actual SA0, yes.

3 Q. Is that a yes to my question, Doctor?

4 A. Repeat the question?

5 Q. Mr. Lainema, the inventor of the '991, was not
6 involved in the development of SA0 at the ITU?

7 A. No.

8 Q. He was not involved, right?

9 A. He was not involved, no.

10 Q. We'll come back to the SA0 technology in a
11 second. Let's talk about domestic industry.

12 You're not relying on any Nokia products for your
13 technical domestic industry, right?

14 A. That's right.

15 Q. And that's because you don't know of any Nokia
16 H.265 products, right?

17 A. That's probably true. That's right.

18 Q. And you don't know of any other Nokia products
19 that relate to the '991 patent, right?

20 A. I did not review them, so I can't say I know of
21 them. I also don't know that they don't exist, but, no, I
22 don't know of them.

23 Q. That's a yes to my question, right? You're not
24 aware of any Nokia products related --

25 A. That's true.

1 Q. -- to the '991 patent, right?

2 A. That's true.

3 Q. I have limited time. So it would be helpful if
4 you answered yes or no to my yes-or-no questions.

5 A. Sure.

6 Q. Thank you. You're relying exclusively on
7 Microsoft and Samsung products, right?

8 A. For domestic industry.

9 Q. For domestic industry.

10 A. Yes.

11 Q. You didn't talk to anyone at Microsoft or Samsung
12 related to the '991 patent, right?

13 A. Correct.

14 Q. For those products, those domestic industry
15 products, you're relying on chips in those products, right?

16 A. Correct.

17 Q. And you're accusing those chips based on their
18 H.265 capability, right?

19 A. Correct.

20 Q. You haven't talked to any of those chip
21 manufacturers either, right?

22 A. Correct.

23 Q. On one of your last slides -- and I can pull it
24 up if you need me to, but it contains third-party CBI, so
25 I'd like to avoid the third-party CBI shuffle.

1 A. Sure.

2 Q. You had a row related to AMD. Do you recall
3 that?

4 A. Yes, I do.

5 Q. You're relying on the same source code cites for
6 all the products in that row; is that correct?

7 A. Yes, I believe so.

8 Q. Okay. So every product that's listed in that
9 row, you're pointing to the exact same source code,
10 regardless of whether or not it's an accused product or
11 domestic industry product, right?

12 A. I believe that's true, yes.

13 Q. Can we please pull up 4C.33.

14 You had this slide on prior art decoding -- yeah,
15 prior art decoding, right?

16 A. Yes.

17 Q. Okay. You weren't trying to give the Court --
18 and, actually, let's show the next slide too.

19 You contrasted these two slides, right?

20 A. Yes.

21 Q. So if we look at the slide on the right, you
22 weren't trying to give the Court the impression that none of
23 the prior art has spatial samples that are used as
24 prediction error, right?

25 A. Well, I -- when I say "prior art," I was -- I

1 mean H.264, so...

2 Q. Okay, but that's not what the slide is titled, is
3 it?

4 A. You're right. You're right.

5 Q. It's kind of misleading, right?

6 A. That's right. Maybe I should say typical prior
7 art decoding.

8 Q. Okay. So on the left, you would agree H.263 and
9 H.264 work like the prior decoding slide on the left, slide
10 33, right?

11 A. I agree, yeah.

12 Q. But you're aware of prior art, right, that also
13 has prediction error that uses spatial samples, right?

14 A. Yes, I suppose so.

15 Q. Okay. And you also read the inventor's
16 deposition transcript, right?

17 A. Yes, I did.

18 Q. You're aware the inventor acknowledged that there
19 was prior art?

20 MR. LIPSCHITZ: Objection, Your Honor. We're
21 going beyond the scope. This is a validity cross, and his
22 direct is limited to infringement.

23 JUDGE ELLIOT: Overruled.

24 BY MR. MILLIKAN:

25 Q. You're aware Mr. Lainema admitted that there was

1 -- that there was prediction error in both the transform and
2 spatial domain that was known before his patent, right?

3 A. At this point, I don't remember that section of
4 his deposition, but if you show me, I wouldn't challenge
5 that.

6 Q. Okay. Let's pull up Lainema deposition
7 transcript 416, starting on line 21.

8 "Prediction error coding was known before this
9 patent, right?

10 "Answer: That is correct.

11 "Question" -- sorry, on the bottom left, line
12 21, 416. So everybody can see it. So I'll start again,
13 Doctor. 416, line 21.

14 "Question: Prediction error coding was known
15 before this patent, right?

16 "Answer: That is correct.

17 "Transform coding was known before this patent,
18 right?

19 "Answer: That is correct.

20 "Transform coding of prediction error was known
21 before this patent, right?

22 "Answer: That is also correct."

23 And then if we go down to line 11, it says:
24 "Coding prediction error in both the transform and spatial
25 domain was known before the patent?"

1 The witness: "I think so."

2 Did I read that correctly?

3 A. I believe you did, yes.

4 Q. Okay. So if we go back to those two
5 demonstratives, can we agree that it was misleading to
6 suggest that the prior art didn't have spatial samples that
7 coded prediction error?

8 A. I know of a piece of prior art that has some
9 spatial samples.

10 Q. And the inventor seemed to too as well, right?

11 A. I thought my reading of that is that the inventor
12 wasn't sure. I think that's what I usually do -- what I
13 mean when I say I think so.

14 Q. Okay. He thought so, though, right?

15 A. That's what it appears --

16 Q. That was his testimony?

17 A. -- yeah.

18 Q. Okay. On direct you mentioned prediction error
19 several times, right?

20 A. Yes, I did.

21 Q. And I think you identified that that's a dispute
22 between the parties, what is prediction error, right? And
23 you have -- is that a yes?

24 A. I guess so. I think what you're referring to is
25 part of the question, and I think the question that was

1 asked me was that there is a contention that spatial is not
2 part of prediction error. So I would say that's what I was
3 asked about and that's what I answered. That's not what you
4 just asked me.

5 Q. Okay. You understand that there's a dispute
6 between the parties as to what is included or excluded from
7 prediction error; is that fair?

8 A. Yes, that's -- yeah, that's fair.

9 Q. You have two different definitions for prediction
10 error; is that right?

11 A. I believe prediction error is just the difference
12 between the prediction and the thing you're trying to
13 predict. I don't know that there is another one.

14 Q. Okay. We'll come back to this. Let's look at
15 the claims really fast.

16 A. Okay.

17 Q. Let's pull up CDX-4C.46.

18 On the left-hand side of claim limitation 22[a],
19 it says receiving a coded prediction error signal, right?

20 A. Right.

21 Q. The rest of the claim limitations all relate to
22 prediction error, right, in some way or another?

23 A. The coded prediction error, yeah.

24 Q. Right. The coded prediction error. And encoders
25 create the coded prediction error, right?

1 A. Yes, they do.

2 Q. Right. So it might be relevant to look at what
3 encoders do to understand what is encoded prediction error,
4 right?

5 A. It might be.

6 Q. Okay. And the coded prediction error has to have
7 both a plurality of transform coefficients and a plurality
8 of spatial samples, right?

9 A. Yes.

10 Q. The claims require both, right?

11 A. That's right.

12 Q. You'd agree one was not good enough, right?

13 A. That's correct.

14 Q. Before we turn to your construction -- or your
15 definitions for what prediction error are, let's look at
16 what the '991 says.

17 Can we go to the '991 background of the
18 invention, column 1, line 37.

19 Starting on the top right, it says, "The second
20 phase involves coding the prediction error, i.e., the
21 difference between the predicted block of pixels and the
22 original block of pixels."

23 Did I read that correctly?

24 A. Yes, you did.

25 Q. "i.e." means "that is" or "in other words,"

1 right?

2 A. Yes.

3 Q. So the '991 here is telling us that prediction
4 error means the difference between the predicted block of
5 pixels and the original block, right?

6 A. Correct.

7 Q. Let's go to the summary of the invention.
8 Column 3, line 13.

9 At the top, it starts with "According to various
10 embodiments of the present invention, a system and method of
11 encoding a prediction error signal for a block of data
12 comprises calculating a difference signal representing
13 differences between sample values of a predicted block of
14 data and values for an original input block of data."

15 Did I read that correctly?

16 A. Yes.

17 Q. That's consistent with the "i.e." statement that
18 we just read to, right?

19 A. I believe it is, yes.

20 Q. You've got the predicted block and the original
21 block, and you take the difference of those two, right?

22 A. Yes.

23 Q. Okay. Let's look at the figures of the '991
24 patent, including some figures that you didn't show the
25 Court during your direct testimony. Let's start with the

1 '991 encoder Figure 3, but I'm going to pull up a
2 demonstrative to guide our conversation.

3 Please pull up our -- I'm sorry, Exhibit RX-5503.

4 Do you remember this figure from your deposition?

5 A. Yes, I do.

6 Q. Exhibit 2, right? It's still marked as Exhibit 2
7 to your deposition?

8 A. I guess so, yeah.

9 Q. You agree the labels on Exhibit Number 2 show
10 Figure 3 of the '991 patent accurately, right?

11 A. I believe that they are accurate, yes.

12 Q. Okay. I did notice one correction on this
13 figure, the add -- the adder right in the middle is missing
14 a subtraction sign. So right below prediction error signal
15 320, there's an adder. And there should be a subtraction
16 sign by it on the left-hand side of the arrow that's -- so
17 below the adder, sort of like the bottom left of the adder,
18 there should be a minus sign. Is that right?

19 A. I agree, yes.

20 Q. Okay. So we can --

21 A. Actually, shouldn't the subtraction sign be on
22 the bottom?

23 Q. Okay. Below the adder and sort of to the left,
24 right?

25 A. Yeah.

1 Q. Okay. We can agree on that. So we'll sort of
2 make that notation going forward in our heads.

3 Annotated Figure 3 shows a prediction -- a
4 predicted error signal 320, right?

5 A. Yes, it does.

6 Q. Okay. And then this figure, this is an encoder
7 figure, right?

8 A. Yes, it is.

9 Q. It shows the prediction error signal 320 to be
10 the difference between the original image signal 300 and
11 image block 320, which is a predicted block, right?

12 A. 312, you mean?

13 Q. 312.

14 A. 312, yes.

15 Q. Okay. So in the encoder of Figure 3, it shows a
16 prediction error signal that's the difference between the
17 original and the predicted block, right?

18 A. That's true.

19 Q. Let's look at the decoder.

20 And please pull up RX-5504.

21 Do you remember this from your deposition?

22 A. Yes, I do.

23 Q. Okay. It was Exhibit 3 to your depo, right?

24 A. That's true.

25 Q. You agree the labels on this exhibit are

1 accurate, right?

2 A. I don't have time to check the details now, but
3 at the deposition, I think I did check them, so I'll --

4 Q. Do you have any doubts?

5 A. No, I don't.

6 Q. It also has a box that says "prediction error
7 decoding" on the top left, right?

8 A. Yes.

9 Q. That's where the coded prediction error is
10 decoded in Figure 6, right?

11 A. Yes, it is.

12 Q. On the bottom right on the opposite side of the
13 decoder, there's a filtering 620, right?

14 A. That's true.

15 Q. In this figure of the '991 patent, filtering is
16 outside of prediction error box 620, right?

17 A. It is outside of box 602, I guess is what you --

18 Q. H.265 calls Sample Adaptive Offset a filter,
19 right?

20 A. It does call it a filter, yes.

21 Q. So your infringement theory is effectively taking
22 that filter and moving it over to the prediction error
23 decoding blocks, right?

24 A. H.265 reference to filter is not the filter 620.
25 Or its calling SAO a filter is in no way related to box 620.

1 Q. We can agree that SA0 is a filter, right?

2 A. SA0 is referred to as a filter by some people in
3 some contexts.

4 Q. And the '991 patent never teaches coding
5 prediction error, spatial samples using a filter, right?

6 A. I'm not sure what that -- what your question
7 means.

8 Q. Doctor, you didn't show an embodiment of the '991
9 patent where spatial samples were added using a filter,
10 right, on your direct examination?

11 A. I thought we agreed that H.265 called something a
12 filter. I don't think there's -- I have no testimony, I
13 don't believe, that you couldn't call it various things, a
14 filter. So --

15 Q. Doctor, I am asking you about what's disclosed in
16 the '991 patent, right? The '991 patent talks about
17 filters, right?

18 A. It does.

19 Q. And it talks about prediction error encoding and
20 decoding, right?

21 A. It does.

22 Q. It never says to do prediction error encoding or
23 decoding in the filter, right?

24 A. No, it does not. I agree.

25 Q. Let's talk about your first definition. You

1 would agree with the definition we talked about for the '991
2 patent, the difference between -- that the prediction error
3 is the difference between a predicted and original signal,
4 right?

5 A. Yes.

6 Q. So that's one definition, right?

7 A. Yes.

8 Q. And that's consistent with what we saw in the
9 '991 patent, that definition, right?

10 A. Yes.

11 Q. You have a second definition that you gave in
12 your testimony today, right?

13 A. I believe I can think of at least one slide where
14 I precisely call that same difference the prediction error.

15 Q. Okay.

16 A. I guess I'm not --

17 Q. Your second definition of prediction error is the
18 difference between the prediction and the output of the
19 decoder, right?

20 A. That's the decoded prediction error. That's a
21 coded prediction error.

22 Q. Right. So you have -- you have two different
23 definitions of prediction error --

24 A. I --

25 Q. -- one that you apply to the encoder and one that

1 you try and apply to the decoder, right?

2 A. I have a definition of prediction error. And I
3 have a definition of coded prediction error. And they are
4 different.

5 Q. Right. And the difference is, between those two,
6 you switch between looking at the original input signal and
7 looking at the output of a decoder, right?

8 A. Yes. At the decoder, that's all you have, is the
9 output of the decoder.

10 Q. During your direct examination, you didn't point
11 to any excerpts from the '991 for your second definition,
12 the decoder output definition, of prediction error, right?

13 A. I don't recall the entirety of my deposition, but
14 I don't recall having offered -- pointing to anything like
15 that, yeah.

16 Q. You didn't share that today, right?

17 A. I did not, no.

18 Q. And you didn't point to anything in the H.265
19 standard that defines prediction error or coded prediction
20 error as the difference between the prediction and the
21 decoder output, right?

22 A. I did not point to anything today, no.

23 Q. And for your second definition, you'd agree with
24 me that you have no written support for that second
25 definition, right?

1 A. I haven't provided any written support, yes.

2 Q. You accuse the SAO parameters of being the coded
3 prediction error signal in the plurality of spatial samples
4 under that second definition, right?

5 A. I identified the spatial information as being a
6 part of the coded prediction error.

7 Q. Right. And that's under the second definition,
8 right, not the first?

9 A. It's under my definition of coded prediction
10 error.

11 Q. And you need to use the second definition to show
12 infringement, right?

13 A. I need to use the second definition because it's
14 the only definition that applies to a decoder, and my
15 infringement case is about a decoder.

16 Q. Right. So that's a yes to my question? You need
17 that second definition, right?

18 A. Yes.

19 Q. You don't have an infringement theory under the
20 first definition, right?

21 A. No.

22 Q. In building your second definition of prediction
23 error, you rely on the term "residual," right?

24 A. I don't think I rely on the term "residual," but
25 there is a relationship in what people call a residual and a

1 prediction error, yes.

2 Q. And that's based on -- you're using some
3 definition of "residual" in the H.265 standard, right?

4 A. I think there is a definition of "residual" in
5 the H.265 standard that is related to these issues we're
6 talking about.

7 JUDGE ELLIOT: Mr. Millikan, I would like to take
8 our break, our morning break sometime in the next few
9 minutes. Let me know when a good time would be.

10 MR. MILLIKAN: I'd be happy to do that now, Your
11 Honor.

12 JUDGE ELLIOT: All right. I have 10:34. Let's
13 come back at 10:50, 10:50.

14 And during our break, sir, please don't discuss
15 your testimony with anyone.

16 THE WITNESS: Yes, of course.

17 (A recess was taken at 10:34 a.m., after which
18 the proceedings resumed at 10:50 a.m.)

19 JUDGE ELLIOT: Have a seat. Go ahead.

20 MR. MILLIKAN: Thank you, Your Honor.

21 BY MR. MILLIKAN:

22 Q. Doctor, I thought before the break you testified
23 that you didn't rely on the term "residual" in the H.265
24 standard for your definition. Is that right?

25 A. I didn't rely. I relied on my understanding of

1 what an error is, but it is consistent with what I -- I
2 wouldn't use the word "rely."

3 Q. It is not part of the basis of your understanding
4 of prediction error?

5 A. It kind of supports it, but I would have had that
6 understanding before.

7 Q. Let's pull up slide 4C.31.

8 Can we agree the H.265 standard calls some things
9 residual and some things it does not call residual?

10 A. That's -- I agree.

11 Q. Okay. And this demonstrative, you're
12 demonstrative 31, is another document. This is from a
13 publication, right?

14 A. Yes, it is.

15 Q. And it refers to residues, right in the middle
16 there in blue, right? And for residues, it points to the
17 frequency coefficients, right, the transform coefficients?

18 A. That's correct.

19 Q. But it uses different words, Sample Adaptive
20 Offset information to refer to the SAO stuff, right?

21 A. That's correct.

22 Q. Let's go to slide 4C.55.

23 This is -- on this slide, you have an excerpt
24 from the H.265 standard, right?

25 A. That's right, two excerpts, yeah.

1 Q. Section -- on the left it shows section
2 7.3.8.1.1; is that right?

3 A. That's right.

4 Q. And that is bitstream syntax, right?

5 A. Yes, it is.

6 Q. And it uses the words after that residual coding
7 syntax, right?

8 A. Yes, it does.

9 Q. And then you point to a bunch of things in that
10 section for the transform coefficients again, right?

11 A. That's right.

12 Q. There's no dispute between the parties, the
13 transform coefficients are prediction error, right?

14 A. They are part of prediction error, yes.

15 Q. The dispute is whether or not the Sample Adaptive
16 Offset is prediction error, right?

17 A. Correct, that's my understanding.

18 Q. Let's go to slide 57. This is your comparable
19 slide for Sample Adaptive Offset, right?

20 A. That's correct.

21 Q. This doesn't show a heading from the H.265
22 standard calling it residual, right?

23 A. It does not show it, no.

24 Q. That's because that heading doesn't exist, right?

25 A. I agree.

1 Q. Nowhere in the H.265 standard does it call SA0
2 residual, right?

3 A. That's correct.

4 Q. Did you search for it just to check?

5 A. I don't think you would call it search but I
6 understand that it's not there, yeah.

7 Q. Okay. So you agree, you looked, and it is not
8 there, right?

9 A. It's not there.

10 Q. So just to be clear, the H.265 standard calls
11 transform coefficients residual, which you say is comparable
12 to prediction error, right?

13 A. Yes.

14 Q. And the H.265 standard does not call Sample
15 Adaptive Offset information residual, right?

16 A. Correct.

17 Q. Let's do one last topic. You know Gary Sullivan,
18 right?

19 A. I do. He's a good friend.

20 Q. He's at Microsoft, right?

21 A. Yes.

22 Q. He cochaired -- he chaired the group that led the
23 H.264 and cochaired the group that led the 265, right?

24 A. That's correct.

25 Q. Would you say he is a person of extraordinary

1 skill?

2 A. Absolutely.

3 Q. I think at the last trial you even cited to one
4 of his papers, right?

5 A. Yes. And he and I have papers together, yeah.

6 Q. Okay. Please pull up CX-8653.

7 This is a book entitled High Efficiency Video
8 Coding, HEVC. Did I get that right?

9 A. I believe, yeah, I think that's correct.

10 Q. That's another name for H.265, right?

11 A. That is another name for H.265.

12 Q. The third name listed there is Gary Sullivan,
13 right?

14 A. That's correct.

15 Q. He is listed as an editor. Is that right?

16 A. That's correct.

17 Q. You're familiar with the mode in H.265 called
18 transform skip mode, right?

19 A. Coarsely, yes.

20 Q. So you know there is a mode in H.265 that does
21 actually encode prediction error in the spatial domain,
22 right?

23 A. I guess so. I'm not familiar with the details of
24 it but I guess so, yeah.

25 Q. Can we go to page 0251.

1 Can we scroll down to where it says transform
2 skip. Keep going. So Section 8.6.2 is called transform
3 skip. Do you see that?

4 A. I see that, yes.

5 Q. The next sentence reads "for regions or blocks
6 with many Sharp edges (e.g., as typically given in screen
7 content coding), coding gains can be achieved by skipping
8 the transform."

9 Did I read that correctly?

10 A. Yes.

11 Q. "When the transform is skipped for a given block,
12 the prediction error in the spatial domain is quantized and
13 coded in the same manner as transform coefficient coding
14 (i.e., the quantized block samples of the spatial error are
15 coded as if they were quantized transform coefficients)."

16 Did I get that right?

17 A. Yes.

18 Q. This book is describing transform skip mode as
19 prediction error coded in the spatial domain, right?

20 A. That is correct.

21 Q. That's what you're saying SA0 is, right?

22 A. SA0 is also prediction error coded in the spatial
23 domain. So I am not saying it is equal to this in its role
24 in H.265, but it -- one can make analogies between the two.

25 Q. Doctor, that was a yes to my question, right?

1 A. I'm not -- I am not saying that this -- I did not
2 testify anywhere that SA0 is this, no. I thought that was
3 your question.

4 Q. My question was you're saying SA0 is coding
5 frequency, coding prediction error in the spatial domain,
6 right? That's your infringement theory, right?

7 A. It's coding spatial samples and adding spatial
8 samples into the prediction error.

9 Q. Okay. I think we're agreeing. I don't think
10 there is any real daylight between the two things that we're
11 saying. And my point is, in H.265, it doesn't call SA0
12 residual, which you equate with prediction error, and
13 there's another mode, this mode, where they actually
14 describe it as doing what you are accusing SA0 of.

15 Does that make sense?

16 A. I would not agree that this is what I was
17 accusing SA0 of.

18 Q. Okay.

19 A. This is not SA0.

20 Q. Right. But the claims say that you're coding
21 prediction error in the spatial domain, right, using spatial
22 samples, right?

23 A. The claims say to decode the spatial samples into
24 spatial information and then to add spatial information -- I
25 am trying to be precise of what the claims say. I don't

1 think the claims say what you just proposed they said.

2 Q. Let's look at this graphically. Let's go to
3 Figure 6.10. 0172.

4 At the top of that you see Figure 6.10. Do you
5 see that?

6 A. Yes.

7 Q. It says Figure 6.10, I_PCM lossless and transform
8 skip modes in decoder. Do you see that?

9 A. Yes.

10 Q. On the right-hand side at the top it says
11 bitstream. Do you see that?

12 A. I do.

13 Q. Okay. Then on the left it says intra/inter
14 prediction. Do you see that?

15 A. I see that.

16 Q. And in the middle, it has inverse transform. Do
17 you see that as well?

18 A. I do see that.

19 Q. And then there's a label that says transform skip
20 mode. Do you see that?

21 A. I see that.

22 Q. So this shows -- this shows when you enable
23 transform skip mode you bypass the transform, right?

24 A. That's what that shows.

25 Q. All right. And the steps that it takes in this

1 block diagram when you skip are you entropy decode, you
2 de-quant, right, and then you add it to the prediction; is
3 that right?

4 A. That's true.

5 Q. If we look at the Figure 6, the '991 decoder,
6 those are the same steps for spatial decoding in Figure 6 of
7 the '991 decoder, right?

8 A. I would have to look at -- I'd have to look at
9 them side-by-side. I have done my analysis according to the
10 claim constructions and the claim construction requires that
11 skip -- that spatial samples are created and the
12 decoding of the spatial samples into spatial information.

13 Q. Doctor, are the blocks the same in Figure 6.10
14 when you do skip and spatial decoding in Figure 6 of the
15 '991; yes or no?

16 A. If you will direct me to those blocks you want me
17 to analyze, I will answer your question.

18 Q. Sure. Let's pull up Figure 5504.

19 On Figure 6, you have entropy decoding 600?

20 A. Yes.

21 Q. And you have an inverse spatial quantizer 610,
22 right?

23 A. Yes.

24 Q. So you entropy decode, you inverse quantize, and
25 then you add it to the prediction, right?

1 A. In the adder there to the right, I see that, yes.

2 Q. Okay. Let's go back to 8653 and the first
3 excerpt from 8.6.2. It is 0251.

4 If we go -- you will agree with me if you're
5 skipping the transform, you're not creating transform
6 coefficients, right?

7 A. You're not creating? Is that what you said?

8 Q. Yeah. When you skip the transform, you're not --
9 you're not decoding transform coefficients?

10 A. Decoding, yes, I -- yes, I agree.

11 Q. Okay. So even though this mode offers an option
12 of decoding or, yeah, decoding prediction error in the
13 spatial domain, it is either/or, right? You can either code
14 transform coefficients, prediction error transform
15 coefficients or you can code prediction error in the spatial
16 domain, right?

17 A. That's right.

18 Q. You can't do both, right?

19 A. That's what it appears, yes.

20 Q. And the claims of the '991 require both, right?

21 A. Yes, they do.

22 Q. Let's look at your slide again, just to confirm,
23 CDX-4C.46.

24 Element A reads receiving a coded prediction
25 error signal, the coded prediction error signal including a

1 plurality of transform coefficients and a plurality of
2 spatial samples. Right?

3 A. A plurality of spatial samples, yes.

4 Q. So for the '919 claims, you have to have both,
5 right?

6 A. That's true.

7 Q. But H.265 has a mode where it is either/or,
8 right?

9 A. It's either transform coefficients or a block of
10 spatial data. That's not necessarily spatial samples, nor
11 is there decoding the plurality of spatial samples into
12 decoded spatial information in step C there.

13 Q. So for transform skip mode it's "or," and for the
14 claims of the '991 it's "and," right?

15 A. I guess the two -- the "or" that you referred to,
16 yes.

17 MR. MILLIKAN: Pass the witness.

18 JUDGE ELLIOT: Hold on.

19 MS. DUCCA: The Staff has no questions for
20 Dr. Orchard.

21 JUDGE ELLIOT: Very well. Go ahead.

22 MR. LIPSCHITZ: Thank you, Your Honor.

23 REDIRECT EXAMINATION

24 BY MR. LIPSCHITZ:

25 Q. First, I want to clarify something. For the

1 domestic industry analysis that you did, are you relying on
2 the chips or are you relying on the domestic industry
3 products?

4 A. I'm relying on the products which are -- use the
5 chips for acceleration.

6 Q. Okay. Now, counsel suggested that you're using
7 two different definitions of prediction error. Do you
8 remember that?

9 A. I remember that, yes.

10 Q. Let's pull up JX-10 and let's look at 138 to 40,
11 please.

12 And he pointed to this here where it says the
13 prediction error, i.e., the difference between the predicted
14 block of pixels and the original block of pixels.

15 Do you see that?

16 A. I do see that.

17 Q. Now, is this exactly what the encoder sends to
18 the decoder?

19 A. No, it's not.

20 Q. Okay. Now, in this case, are the asserted claims
21 on the encoder or on the decoder?

22 A. It's on the decoder side.

23 Q. Are we focusing on what an encoder is doing or on
24 what a decoder is doing in the claims?

25 A. We're focusing on the operations of the decoder.

1 Q. Okay. And so why is this not exactly what the
2 encoder sends to the decoder?

3 A. Because if the encoder were to attempt to send
4 that, it would need a very, very large, if not infinite
5 number of bits to send that exact difference.

6 Q. So what does the encoder send to the decoder?

7 A. The encoder encodes this prediction error. I
8 think we depicted that in slides earlier. And sends the
9 coded -- its bits that represent the coded prediction error,
10 which is not this.

11 Q. Okay. So what does the decoder receive?

12 A. The coded prediction error.

13 Q. Okay. And what does the claim specify includes
14 the spatial samples and the transform coefficients?

15 A. The coded prediction error.

16 Q. The coded prediction error. And what is the
17 coded prediction error?

18 A. It's the -- everything that the coder -- that the
19 decoder adds to the prediction to produce the decoded block.

20 Q. Okay. Now, we talked about Sample Adaptive
21 Offset addressing artifacts that you see in the image. Do
22 you recall that? We looked at that image of the word
23 "work."

24 A. Yes.

25 Q. And are those artifacts in the original image

1 being encoded or are they something that is created during
2 the encoding process?

3 A. They are not in the original image. They are
4 some artifacts as part of the processing that is being done.

5 Q. Okay. Are those artifacts received at the
6 decoder?

7 A. The bits that represent the things that are shown
8 in those artifacts are what causes those artifacts.

9 Q. Okay. And what does SAO do with respect -- and
10 let me ask -- sorry -- a different question.

11 Are those artifacts part of the difference
12 between the original image and the predicted image?

13 A. No.

14 Q. I'm sorry. Are those artifacts part of the
15 difference, right, are they in the original image?

16 A. They are not in the original image.

17 Q. So are they part of the difference between the
18 original and the prediction?

19 A. Well, given that the prediction is drawn from the
20 previous frame, which would presumably have those artifacts,
21 I guess they are in the difference, but they are coming from
22 the previous frame.

23 Q. Okay. So when those artifacts -- so SAO, does it
24 address the artifacts that are part of the difference
25 between the final decoded image and the predicted image?

1 A. Yes.

2 Q. Okay.

3 MR. LIPSCHITZ: No further questions. Thank you.

4 MR. MILLIKAN: A really short redirect, Your
5 Honor, or recross.

6 JUDGE ELLIOT: You know, I will give Mr.
7 Lipschitz the last word. So, yes.

8 MR. MILLIKAN: All right. I understand.

9 JUDGE ELLIOT: You can have recross, but I admit
10 there is an ambiguity in my ground rules on this, and it
11 arises because of sometimes the Staff participates and
12 sometimes it doesn't. But, yes, go ahead. And then I will
13 ask Mr. Lipschitz if he has any more.

14 MR. MILLIKAN: Can we pull up '991, claim 1.

15 RE CROSS-EXAMINATION

16 BY MR. MILLIKAN:

17 Q. If we go to the joining limitation at the bottom,
18 it says joining by a processor, the first and second
19 representations to form a coded prediction error signal."

20 Did I get that right?

21 A. That's what it seems to be, yes.

22 Q. So the output of this process that we're going to
23 walk through is a coded prediction error signal, right?

24 A. I'm not familiar with claim 1. I didn't analyze
25 claim 1. But just from reading this section you're pointing

1 me to, it sounds like after this joining, you produce the
2 coded prediction error signal.

3 Q. Sir, you didn't read claim 1 of the '991 patent?

4 A. I read it a long time ago, but I'm not prepared
5 to talk about details.

6 Q. Let's walk through it together.

7 A. Okay.

8 Q. A method comprising calculating by a processor a
9 different signal representing differences between the sample
10 values of a predicted block of data and values for an
11 original input block.

12 Did I read that correctly?

13 A. Yes, that's right.

14 Q. That's the first definition, right? That's the
15 first definition for predicted error code that we talked
16 about, right?

17 A. That is the definition of a prediction error
18 signal, yeah.

19 Q. And this claim says that results in a coded
20 prediction error signal. Do you see that?

21 A. Yes.

22 Q. Okay. So my question to you is, is coded
23 prediction error signal schizophrenic? Does it have one
24 definition when it's in an encoder claim and a different
25 definition when it's in a decoder claim?

1 A. I don't believe it does.

2 Q. Okay.

3 MR. MILLIKAN: No further questions.

4 JUDGE ELLIOT: Mr. Lipschitz, anything?

5 MR. LIPSCHITZ: Just one question, Your Honor.

6 REDIRECT EXAMINATION

7 BY MR. LIPSCHITZ:

8 Q. Is this an asserted claim?

9 A. No, it is not.

10 MR. LIPSCHITZ: No further questions, Your Honor.

11 JUDGE ELLIOT: All right. Thank you,

12 Dr. Orchard.

13 THE WITNESS: Thank you.

14 JUDGE ELLIOT: Going forward, I would like to do

15 this in the following fashion. If the Staff has no

16 questions, then we will do direct, cross, redirect. If

17 whichever side it is wants to do recross, you will have to

18 ask me for permission.

19 If the Staff does have questions, then we will do

20 direct, cross, Staff, redirect, recross. Okay? Make sense?

21 MR. MILLIKAN: Yes.

22 JUDGE ELLIOT: All right.

23 So who is next?

24 MR. SWAIN: Your Honor, for Complainants, our

25 next witness is Dr. Karsten Suehring.

1 Whereupon--

2 KARSTEN SUEHRING,

3 having been first duly sworn/affirmed, was examined and
4 testified as follows:

5

6 THE WITNESS: I swear.

7 MR. NEWCOMER: May I proceed, Your Honor?

8 JUDGE ELLIOT: Yes.

9 DIRECT EXAMINATION

10 BY MR. NEWCOMER:

11 Q. Good morning, Mr. Suehring. Would you please
12 introduce yourself to Judge Elliot.

13 A. Good morning. My name is Karsten Suehring.

14 Q. Where do you live, Mr. Suehring?

15 A. I live in Berlin, in Germany.

16 Q. Is this the first time you're testifying in
17 court?

18 A. Yes, I do.

19 Q. Who do you work for currently?

20 A. I work for Fraunhofer Institute For
21 Telecommunications, Heinrich-Hertz Institute for short, HHI.

22 Q. What is your role at HHI?

23 A. I work as a software commentator for reference
24 software, and as a developer and as a researcher in general.

25 Q. How long have you worked at HHI?

1 A. Full time, since 2001.

2 Q. And in addition to working at HHI, you have been
3 retained in this case by Nokia as an outside consultant,
4 right?

5 A. Yes.

6 Q. Is Nokia compensating you for your time and
7 expense?

8 A. Yes.

9 Q. How much?

10 A. They are paying 600 euros per hour.

11 Q. Does your compensation depend in any way on the
12 testimony you give today or the outcome of the case?

13 A. No, it doesn't.

14 Q. Now, Mr. Suehring, you mentioned you were the
15 software coordinator for video coding standards. Did you
16 also have that role back in 2002?

17 A. Yes, I did.

18 Q. At that time, what was the video coding standard
19 you were implementing?

20 A. The standard was H.264 or ABC.

21 Q. What was the reference software you were
22 coordinating at that time?

23 A. The software's name was joint model, or short JM.

24 Q. Would it be okay if I sometimes refer to that
25 joint model as the reference software?

1 A. Yes.

2 Q. What was the purpose of the reference software?

3 A. The software was there to run coding experiments
4 to test that proposals worked and also as an example for
5 people who wanted to implement this standard.

6 Q. What were your duties as software coordinator for
7 the H.264 reference software?

8 A. So after a JVT meeting, I would collect the list
9 of adopted proposals and I would set up an implementation
10 schedule and then I would coordinate with the people on that
11 schedule to get all the proposals implemented into the
12 reference software.

13 Q. In your general practice, how did you determine
14 the order of implementing the different proposals that had
15 been adopted?

16 A. So the most important thing was dependencies on
17 each other, also often coding proposals for scheduled first
18 because when they were experiments run, the software would
19 already be kind of available. High level syntax would be a
20 bit later because the code would have to be written first.

21 Q. You mentioned the term dependencies. Could you
22 explain to Judge Elliot what you meant by dependencies
23 there?

24 A. So sometimes there are interactions between the
25 different things that get adopted into a meeting. And so a

1 technology that touches very different parts of the software
2 would have to go in first to be more efficient so that the
3 others could be adopted to the changes in the software.

4 Q. When adopted proposals are being implemented into
5 that code, does the person writing the code have to
6 implement the specification as written?

7 A. Yes.

8 Q. After each meeting, when do you start
9 coordinating the implementation of the adopted proposals?

10 A. Right after the meeting when I receive the
11 meeting report or the draft meeting report.

12 Q. As part of your job, are you authorized to
13 implement adopted proposals into the reference software?

14 A. Yes, the group authorized me.

15 Q. Do you need to be specifically instructed at the
16 end of each meeting to implement each of the specific
17 adopted proposals?

18 A. No. It was just part of my job to go through the
19 list and be active on my own.

20 Q. Let's talk about this a little more focused on
21 the specific proposals here. Do you understand generally
22 you're here to testify about the implementation of certain
23 adopted proposals related to sequence parameter sets,
24 picture parameter sets and slice headers?

25 A. Yes.

1 Q. Did you prepare some timelines that summarized
2 the developmental work of the H.264 reference software in
3 the 2002 time period?

4 A. Yes, I did.

5 Q. Why did you do that?

6 A. To help me remember what happened in this time
7 frame for my depositions.

8 Q. So this was more than two decades ago, right?

9 A. Yes.

10 Q. How did you go about creating the timelines?

11 A. I looked into my e-mail archive. I have specific
12 folders for software, coordination work -- and for the
13 e-mail reflector that was used at the time. And I looked
14 through these e-mails and summarized what I found there.

15 Q. How did you know what to look for?

16 A. When I was retained for Nokia, I got told what
17 this case would be about, so I got told to look for
18 parameters that related to implementations specifically.

19 Q. If we could have CX-7136 on the screen.

20 Do you recognize this document?

21 A. Yes.

22 Q. What is it?

23 A. This is the first timeline that I wrote.

24 Q. If you could put up, Mr. Moreno, 7250, please.

25 Do you recognize this document?

1 A. Yes.

2 Q. What is it?

3 A. This is the second timeline that I wrote.

4 Q. And why did you add the second timeline?

5 A. To fill in more information about the time frame
6 and also add some details about the implementation schedules
7 that were set up.

8 Q. Overall -- and you can take those down, Mr.
9 Moreno.

10 Overall, how frequently did you work on the H.264
11 reference software from August to December 2002?

12 A. It was a major part of my job, so I worked almost
13 every day on some work of coordination.

14 Q. Let's look at a few of those activities. Mr.
15 Moreno, if we could have CDX-3.3.

16 And I have put a screenshot of CX-4929 on the
17 screen. Do you recognize this document?

18 A. Yes, I do.

19 Q. What is it?

20 A. It's a meeting of the JVT-D meeting, JVT-D145.
21 It is an output document of a breakout on high-level syntax.

22 Q. I am not sure if we explained it yet, what is the
23 JVT?

24 A. The JVT is the Joint Video Team. It's a team
25 that worked on standardization of H.264 AVC, at the time

1 heard from experts from ITU and also IC.

2 Q. What was a breakout group of the JVT?

3 A. A breakout group is a group that is smaller than
4 the main meeting group that is set up to discuss a specific
5 topic or if different proposals are going into the same
6 direction to find a common way to move forward.

7 Q. Who authored JVT D145, the document you see here?

8 A. It is Mr. Hannuksela.

9 Q. What was the date of this document?

10 A. It is 25th of July, 2002.

11 Q. After this document was issued, was it adopted
12 into the H.264 standard at the D meeting of the JVT?

13 A. Yes, it was.

14 Q. And did you then implement it into the reference
15 software?

16 A. It was implemented into the reference software
17 then.

18 Q. Let's look at the next document then. Could I
19 have CDX-3.4, please, Mr. Moreno.

20 And this is a screenshot of CX-5609. Do you
21 recognize this document?

22 A. Yes.

23 Q. What is it?

24 A. It's a report of the JVT-D meeting in Klagenfurt.

25 Q. What were the instructions to you in this report?

1 A. It explicitly instructs me as a software
2 coordinator to produce an implementation schedule and for
3 the integration of the adopted proposals and to consult with
4 the experts for the prioritization of the -- to consult with
5 the experts for the prioritization of the integration order.

6 Q. Did that instruction include JVT-D145?

7 A. Yes, it did.

8 Q. How do you know that?

9 A. Because it includes all the adopted proposals of
10 the meeting and JVT-D145 was adopted at this meeting.

11 Q. So at this time, what was your understanding
12 regarding whether the JVT had authorized you and delegated
13 to you to implement JVT-145 into the reference software?

14 A. I understand they delegated the coordination of
15 the implementation to me.

16 Q. And were Dr. Hannuksela and Dr. Wang part of that
17 delegation?

18 A. Yes, they were.

19 Q. How quickly did you get to work?

20 A. I started setting up the implementation schedule
21 right after I received the initial meeting report.

22 Q. How did you decide where to place JVT-D145 into
23 that implementation schedule?

24 A. So in the beginning, I placed some of our big
25 implementations that had a lot of dependencies on them and

1 at a high level syntax proposal, I placed it a bit later
2 because my expectation was the breakout report that the
3 software had to be prepared before it could be integrated
4 into the main software bunch.

5 Q. Let's turn to the next slide, Mr. Moreno,
6 CDX-3.5, which is a blowup of CX-7682.

7 Do you recognize this document?

8 A. Yes, I do.

9 Q. What is this?

10 A. This is a draft after the Klagenfurt meeting of
11 the H.264 AVC specification.

12 Q. And the Klagenfurt meeting was the D meeting of
13 JVT?

14 A. Yes.

15 Q. What is the date of this document?

16 A. The 10th of August, 2002.

17 Q. How do you go about using this type of document
18 in your work implementing the reference software?

19 A. When I receive software back from proponents of
20 its integrations, I would look into the draft specification
21 to compare what they implemented to the text specification
22 of their proposal, how it was integrated into that main
23 document.

24 Q. Based on your work back at that time, do you know
25 whether this incorporates sequence parameter sets, picture

1 parameter sets and slice headers from JVT-D145?

2 A. Yes, it integrated parameter sets and slice
3 header.

4 Q. Thank you. You can take that down, Mr. Moreno.
5 Who did you initially assign to do the
6 implementation coding for JVT-145?

7 A. It was initially assigned to Mr. Hannuksela.

8 Q. What did he say in response?

9 A. He said he could not take over the implementation
10 at the time and asked me to find other people who could
11 volunteer.

12 Q. Could we have CDX-3.6, please, Mr. Moreno.
13 Do you recognize this e-mail?

14 A. Yes.

15 Q. Who sent it to you?

16 A. This was made from Mr. Hannuksela, with a reply
17 to my implementation schedule.

18 Q. What was your understanding as to why he asked
19 you to find somebody else to actually perform the
20 implementation?

21 A. He said he didn't have the time and the
22 knowledge. I think it refers to being JVT-D145 as a result
23 of the breakout group being much wider than his initial part
24 that went into it, so I was looking for somebody to
25 implement the whole document. And I think he wasn't up to

1 doing the whole document.

2 Q. What did you do in response to his request?

3 A. I kept looking for somebody who could volunteer
4 to implement this whole document.

5 Q. If we could have CX-7179 on the screen, please.

6 What is the document I have put on the screen?

7 A. That is an e-mail I sent to the JVT experts,
8 e-mail reflects announcing a new version of the software and
9 updating the implementation schedule as well, that was
10 attached directly to the software. And also pointing out
11 that I need somebody who could take over the implementation
12 of D145.

13 Q. What does this e-mail indicate about the work
14 that was already being done by the JVT regarding the
15 implementation of the D meeting proposals into the reference
16 code?

17 A. The work had progressed. Here at the top it's
18 listing a number of proposals that had already been
19 integrated, and the official and so-called unofficial
20 versions, which were intermediate versions, so it was
21 progressing.

22 Q. You can take that down. Thank you, Mr. Moreno.

23 How common was it for someone who didn't invent
24 the proposal to be the one or to have someone else -- sorry.
25 Let me strike that.

1 How common was it for someone who didn't invent
2 the proposal to implement a proposal from a breakout group
3 like this?

4 A. For breakout groups, usually one person would
5 take over implementation of the whole breakout restart but
6 several proposals which went in the breakout group was very
7 common, just one person would take it to result and, if not,
8 everybody else, a small part of it.

9 Q. As you were looking for someone to code the
10 JVT-D145, was work progressing on the implementation of the
11 broader output from the D meeting?

12 A. Yes, the work was constantly going on. We were
13 obviously busy moving the software forward.

14 Q. All right. Let's look at CX-7190, please, Mr.
15 Moreno.

16 Is this another e-mail you sent?

17 A. Yes.

18 Q. What is the date on this e-mail?

19 A. It is 18th of September, 2002.

20 Q. What are you doing in this e-mail?

21 A. This is another version of the reference software
22 that I released and I am also updating the implementation
23 schedule to revision 4.

24 Q. Let's look at that implementation schedule. If
25 we could have JX-925, please.

1 Do you recognize this document?

2 A. Yes. That's the attached implementation
3 schedule.

4 Q. What is the purpose of this document?

5 A. So it lists the actual work items, the proposals
6 that were adopted at the meeting, the person who we
7 identified as responsible, and also at what time it would be
8 scheduled to be implemented.

9 Q. Did these schedules that you sent out to the JVT
10 change over time?

11 A. Yes, they had to be adopted whenever something
12 wasn't going as planned, something took longer, whatever,
13 any problems somewhere.

14 Q. And were the people who were in the implementer
15 column the individuals that were assigned for a particular
16 adopted proposals at that time, whatever time the schedule
17 was?

18 A. Yes.

19 Q. Thank you, Mr. Moreno. You can take that down.
20 Who did you ultimately find to implement the
21 JVT-D145 reference software?

22 A. Stephen Wegner volunteered to do the
23 implementation.

24 Q. How did you end up finding him to do the
25 implementation related to parameter sets?

1 A. I think I was in contact with him regarding some
2 other document. And then he replied to me that he could
3 take over the whole breakout group result, meaning D145.

4 Q. Around when did he volunteer?

5 A. I think it was around 18th of September as well.

6 Q. After he volunteered, did you delegate to him to
7 implement the JVT-D145 adoption into the reference code?

8 A. Yes, I did.

9 Q. What was your understanding at that time
10 regarding how long it would take him to implement the
11 JVT-D145 parameter set code?

12 A. We had some, even discussions when he took over.
13 And he said there would be some cleanup required to do the
14 implementation. So I thought it would take a little bit
15 longer than what you usually expect people -- the time that
16 we expect people to finish their work.

17 Q. How did that affect your implementation schedule?

18 A. I factored into that time into the planning for
19 the time slot for him putting this code into the official
20 version of the software.

21 Q. How extensive did his work end up being?

22 A. It was as extensive as we expected. It was a
23 complete rewrite of parts of the software.

24 Q. Did you discuss Dr. Wenger's progress with him?

25 A. Yes, I checked in with him from time to time to

1 see what he was doing.

2 Q. While he was doing the coding, were you working
3 on other aspects of implementation from the D meeting?

4 A. Yes. We constantly kept working on the software.

5 Q. If we look at CX-7196, please, Mr. Moreno.

6 This is an e-mail from you dated November 4th,
7 2002. Do you recognize this?

8 A. Yes, I do.

9 Q. What are you doing in this e-mail?

10 A. I'm sending another implementation schedule for
11 -- to the JVT experts group. I am also announcing a version
12 of the -- new version of the reference software that was
13 available at the time.

14 Q. And that new version of the code was JM 50 there
15 in the e-mail?

16 A. Yes.

17 Q. Let's look at the attachments, CX-7197, please,
18 which is also, for reference, JX-1313.

19 Do you recognize this document?

20 A. Yes. It's the implementation schedule.

21 Q. And does this implementation schedule, if you
22 scroll down, Mr. Moreno, include JVT-D145?

23 A. Yes, it does.

24 Q. Okay. And here it references Barry Haskell.
25 What was he doing with regard to JVT-D145 at this time?

1 A. He took over a portion of the document which
2 relates to a technology called picture_order_count or short,
3 POC.

4 Q. And you see JVT-D145, the other part of it, the
5 high-level syntax was scheduled for November 25th. Do you
6 see that?

7 A. Yes.

8 Q. When did you end up sending the code to
9 Dr. Wenger to implement the work he was doing at that time?

10 A. I think it was also on November 25th.

11 Q. Let's look at CDX-3.8.

12 So this is a demonstrative slide that calls out
13 CX-7260. Do you see this?

14 A. Yes.

15 Q. And are you familiar with the e-mail here between
16 Mr. Wenger and Dr. Hannuksela and Dr. Wang?

17 A. Yes. This was an e-mail that was forwarded to
18 me.

19 Q. And in this e-mail, Dr. Wenger indicates "I am
20 hacking the high level syntax into the software." Do you
21 see that?

22 A. Yes.

23 Q. What did that indicate to you?

24 A. That refers to the breakout report of the
25 high-level syntax breakout group or D145.

1 Q. At the time, did it make sense for you that the
2 person implementing the code, Dr. Wenger, was discussing it
3 with the -- Dr. Hannuksela and Dr. Wang, the inventors?

4 A. Yes, it makes sense.

5 Q. Why is that?

6 A. When they are "unclearities," people would just
7 ask whoever wrote the proposal.

8 Q. Thank you. Let's discuss when Dr. Wenger now
9 returned the code to you. If we could have CDX-3.9.

10 When did you receive the software back from
11 Dr. Wenger with JVT-D145 in it?

12 A. I received the software back on 16th of December,
13 2002.

14 Q. Did you have follow-up communications with him?

15 A. Yes. We had a phone call and I also sent an
16 e-mail after I did some debugging.

17 Q. This was 20 years ago. How do you remember that
18 phone call?

19 A. The phone call was quite unusual at the time
20 because we usually communicated with e-mails. But because
21 Stephan also lived in Berlin where I lived at the time, we
22 were originally planning to meet in person and then we had a
23 phone call instead because of scheduling.

24 Q. Did you do anything with the code that he had
25 implemented after you received it back from him?

1 A. Yes, I reviewed it and I tested the code.

2 Q. Did you do any debugging?

3 A. Yes. I also did debugging.

4 Q. What debugging did you do?

5 A. So Stephan mentioned a few things that wouldn't
6 be working perfectly yet. And, therefore, I especially
7 looked into frame/field coding in combination with its
8 implementation.

9 Q. Did you fix the bug that he identified?

10 A. I added a workaround into the code. And I think
11 I mostly fixed the bug.

12 Q. What was JM-50H?

13 A. JM-50H was a software version that I first sent
14 to Stephan Wenger after I debugged the software and then
15 added bug fixes. And that's the same version that I later
16 put on to my download side to download for everybody.

17 Q. And I think I have also seen it referred to as
18 JM-50H-Suehring. Is that the same code set?

19 A. Yes, that is the same file.

20 Q. You can take that down, Mr. Moreno.

21 Did JM-50H software, the implementation of that
22 version, include sequence parameter sets and picture
23 parameter sets?

24 A. Yes, it did.

25 Q. Did you test that implementation?

1 A. Yes, I tested it.

2 Q. What did your tests show?

3 A. The main operation mode of the software was
4 running without any problems.

5 Q. I want to ask you about that testing. How did
6 you go about testing the operation mode?

7 A. I compiled the source code into binary
8 executables. And then I ran the encoder with an
9 uncompressed video creating a bitstream and then ran the
10 bitstream through a decoder, which generated output and I
11 compared these outputs.

12 Q. And did the coding done by Mr. Wenger and you
13 work?

14 A. Yes, it did.

15 Q. I should say Dr. Wenger. By Dr. Wenger and you
16 work?

17 A. Yes.

18 Q. Great. It is a couple basic questions. Did that
19 computer have a processor?

20 A. It did.

21 Q. Did the reference software contain and run a
22 decoder as part of that testing?

23 A. Yes, it did.

24 Q. Did you use video playback at all as part of your
25 testing process?

1 A. I used video playback when I was debugging
2 software because it is easy to spot problems sometimes
3 visually.

4 Q. What else did you do as part of your testing,
5 other than run the software, compare the bitstreams and
6 watch the video playback?

7 A. I would review the code and compare it to the
8 specification.

9 Q. And that specification in this case was JVT-D157?

10 A. Yes, it was.

11 Q. And when you compared it to the specification,
12 was it doing what the specification intended?

13 A. Yes, it was doing what the specification
14 intended.

15 Q. After you did that testing on December 18th,
16 2002, did the reference software related to the parameter
17 sets we're discussing change?

18 A. No, it did not.

19 Q. Let's pull up JX-508, please, Mr. Moreno.

20 Do you recognize this document, Mr. Suehring?

21 A. Yes.

22 Q. What is it?

23 A. This is a list that I assembled listing all the
24 reference software versions for the JM software with a date
25 when it was last modified and where it can today be

1 downloaded.

2 Q. And this seems to suggest that you were modifying
3 and uploading new versions of this coding project throughout
4 August, September, October, November, December of 2002,
5 right?

6 A. Yes.

7 Q. Did you end up distributing the code to the JVT
8 group after you had debugged it?

9 A. Yes, I did.

10 Q. If we could have JDX-3.11, please.

11 This is a callout of CX-7239. Do you recognize
12 this e-mail?

13 A. Yes, I do.

14 Q. What are you conveying in this e-mail?

15 A. The e-mail from me to the JVT experts reflect by
16 announcing the availability of the software that now
17 contains picture and sequence parameter sets.

18 Q. Why did you specifically call out picture and
19 sequence parameter sets there?

20 A. I think we did a big step forward there. This
21 was a whole rewrite and all the changes that went in, so I
22 wanted people to have a look at the software, even over the
23 holidays maybe.

24 Q. Did the recipients of this e-mail include
25 everyone in the JVT experts group?

1 A. Yes.

2 Q. And did that include Dr. Hannuksela and Dr. Wang?

3 A. Yes.

4 Q. So in all, how frequently did you work on the
5 H.264 reference software project implementing the adoptions
6 from the D meeting from August until December 2002?

7 A. Almost worked every day on the software or some
8 kind of bug-fixing or replying to e-mails. It was a
9 significant part of my work at the time.

10 Q. Based on your experience, was the amount of time
11 it took for the implementation of JVT-D145 specifically a
12 typical amount of time for adding that type of feature to
13 the reference software?

14 A. In that time frame, it was a typical time, yes.

15 MR. NEWCOMER: Pass the witness, Your Honor.

16 MR. KLEIN: Good morning, Your Honor. Andrew
17 Klein for Perkins Coie on behalf of the Respondents.

18 CROSS-EXAMINATION

19 BY MR. KLEIN:

20 Q. Good morning, Mr. Suehring. Nice to see you
21 again.

22 A. Good morning.

23 Q. You testified on direct about implementing
24 certain JVT proposals in the reference code, right?

25 A. Yes.

1 Q. And I want to talk about that. But before we do
2 that, I want to set the scene a little bit and separate your
3 obligations to the JVT and to Nokia. So you testified on
4 direct that in 2002, you worked for the Heinrich-Hertz
5 Institute in Berlin, right?

6 A. Yes, I worked for the Heinrich-Hertz Institute.

7 Q. Part of your role was the software coordinator
8 for the JVT, right?

9 A. It was, yes.

10 Q. So you would coordinate work on behalf of the
11 JVT, right?

12 A. I did.

13 Q. At the same time in 2002, Dr. Hannuksela worked
14 for Nokia, right?

15 A. He worked for Nokia but he was also part of the
16 JVT.

17 Q. But he worked for Nokia, correct?

18 A. For the JVT was not an employer, so people at JVT
19 had their own employers, yes.

20 Q. So the JVT is separate from Nokia, right?

21 A. It's a standardization organization.

22 Q. Okay. So Nokia is a company, right?

23 A. Yes.

24 Q. Okay. And he wasn't your boss in 2002?

25 A. No, he was not my boss.

1 Q. You didn't report to him?

2 A. No.

3 Q. If he asked you to do something, you didn't have
4 to do it, right?

5 A. I didn't have to do it.

6 Q. Okay. And Ye-Kui Wang wasn't your boss in 2002,
7 either, right?

8 A. He was also not my boss.

9 Q. That's because in 2002, again, you worked for the
10 Heinrich-Hertz Institute, correct?

11 A. Yes.

12 Q. And he was affiliated with the University of
13 Tampere, right?

14 A. As far as I remember, yes.

15 Q. And just like Dr. Hannuksela, if Mr. Wang asked
16 you to do something, you didn't have to do it either, right?

17 A. The -- I wouldn't have to do it.

18 Q. So you wouldn't have to do it, right?

19 A. Right.

20 Q. Now, I want to talk about what was implemented
21 into the reference code because I want to make sure we're on
22 the same page about that.

23 So you talked about JVT-D145 during your direct,
24 right?

25 A. Yes.

1 Q. And you agree that what was proposed in JVT-D145
2 was ultimately incorporated into the reference code, right?

3 A. So the exact match was with the D157 document
4 which was slightly different from what was in D145.

5 Q. So what was proposed in D145 did not make it into
6 the reference code?

7 A. D145 was taken by the editors of the
8 specification and integrated into D157. And the software
9 was matched with D157 which then, ultimately matched this
10 input.

11 Q. And so the JVT-D145 document was the result of a
12 breakout group, right?

13 A. Yes.

14 Q. You talked about that during your direct?

15 A. Yes.

16 Q. And a breakout group is a group formed during one
17 of these meetings to discuss several proposals related to
18 some technology or some aspect of the standard, right?

19 A. It is, yes.

20 Q. And the breakout document summarizes the group's
21 discussion, right?

22 A. It does, yes.

23 Q. Now that we agree on what was implemented into
24 the reference code, let's get on the same page about who
25 implemented JVT-D145 into the reference code.

1 You testified on direct that Dr. Hannuksela was
2 originally tasked with implementing JVT-D145 into the
3 reference code, right?

4 A. Yes. I put him on the first version of the
5 schedule, yes.

6 Q. Shortly after being tasked, Dr. Hannuksela
7 e-mailed the JVT about implementing JVT-D145, correct?

8 A. I think he directly responded to me but the
9 e-mail was also, I think, on the e-mail reflector, yes.

10 Q. Let's take a look at your demonstratives. May we
11 have CDX-3.6.

12 This is one of the demonstratives from your
13 direct testimony, right?

14 A. Yes.

15 Q. And this is an e-mail from Dr. Hannuksela to the
16 JVT dated August 19th, 2002, right?

17 A. Yes.

18 Q. And on this demonstrative, you highlighted the
19 last sentence in the e-mail to direct everyone's attention
20 to it, right?

21 A. It's highlighted, yes.

22 Q. I was reading this e-mail during your direct and
23 noticed something that you might have suggested but you
24 didn't highlight to show to everyone in the courtroom.

25 So if we look at the sentence right before the

1 one you highlighted, Dr. Hannuksela says "unfortunately, I
2 lack the time, the skills, and the knowledge how to
3 implement JVT-D145 into the reference -- or into the
4 software.

5 Did I read that correctly?

6 A. Yes, that's there.

7 Q. So in his own words, Dr. Hannuksela lacks skills,
8 he lacks the time, and he lacks the knowledge to implement
9 JVT-D145 into the reference, right?

10 A. Yes. But D145 was more than just his proposal.

11 Q. But he didn't implement any of JVT-D145 into the
12 reference code, did he?

13 A. He didn't end up implementing that.

14 Q. After this e-mail, you didn't have a single
15 exchange with Dr. Hannuksela about implementing JVT-D145
16 into the reference code, right?

17 A. I don't have a direct exchange. We have seen
18 before the e-mail that I got forwarded from Stephan Wenger
19 talking to Mr. Hannuksela and Mr. Wang.

20 Q. I am not asking about Mr. Wang here. I am asking
21 about you, Mr. Suehring. You did not have another
22 discussion with Dr. Suehring about implementing JVT-D145
23 into the software, right?

24 A. You mean Dr. Hannuksela?

25 Q. Yes. Sorry.

1 A. You said my name.

2 Q. Thank you.

3 A. I didn't find any direct communication in my
4 e-mail.

5 Q. Around that time, Mr. Wang, the other inventor on
6 the '818 patent, reported he was too busy to implement
7 JVT-D145 into the reference code; isn't that right?

8 A. He said that in an e-mail, yes.

9 Q. But the two named inventors had time to work on
10 other proposals, didn't they?

11 A. I'm aware that Mr. Wang implemented other
12 proposals.

13 Q. Well, let's take a look at what the documents
14 show. May we have CX-7169, please.

15 This is an e-mail from Mr. Wang, correct?

16 A. Yes, it is.

17 Q. And it's dated August 18th, 2002?

18 A. Yes.

19 Q. And Mr. Wang says "we, me, Dong Tian and Miska
20 Hannuksela would like to implement our stuffs, JVT-D095,
21 097, 098, 099, 100, 101, either after or before Stephan's
22 JVT-D065."

23 Did I read that right?

24 A. Yes.

25 Q. So in this e-mail he identifies himself,

1 Mr. Wang, Dong Tian and Miska Hannuksela, correct?

2 A. Yes, he does.

3 Q. And he wants to implement our "stuffs" as he
4 calls it, right?

5 A. Yes. I think it refers to documents that were
6 directly adopted in the meeting and not going through a
7 breakout group.

8 Q. And so the "stuffs" he refers to are JVT-D095,
9 097, 098, 099, 100, 101; is that right?

10 A. Yes.

11 Q. That's six stuffs he wants to work on, right?

12 A. Yes. I don't remember how big those were or if
13 they were tiny things or they were bigger changes.

14 Q. But this e-mail doesn't identify D145 as one of
15 those stuffs, does it?

16 A. It doesn't.

17 Q. And this e-mail was sent right around the time
18 Mr. Wang reported to you that he was too busy to work on
19 implementing JVT-D145 into the reference code; isn't that
20 right?

21 A. It seems to make sense since he was working on
22 these documents here.

23 Q. So we have one inventor, Mr. Hannuksela, or
24 Dr. Hannuksela, excuse me, who lacks the time, skills, and
25 knowledge to JVT -- to implement JVT-D145 into the reference

1 code, and we have the other inventor who would rather work
2 on his stuffs unrelated to JVT-D145.

3 Does that sound about right?

4 A. He committed to doing those documents, rather
5 than D145 at this time, yes.

6 Q. And there was something else on your direct that
7 piqued my interest. You said during your direct that
8 Stephan Wenger was delegated to implement the parameter set
9 proposal into the reference code. Is that right?

10 A. After he volunteered, I assigned the document to
11 him, so I would think that means I delegated it to him, yes.

12 Q. So can we have CDX-3.7, please.

13 At the top of your demonstrative, it says
14 Dr. Wenger delegated to implement JVT-D145, right?

15 A. Yes.

16 Q. So after Dr. Hannuksela and Dr. Wang decided not
17 to work on JVT-D145, the JVT tried to find somebody to
18 incorporate JVT-D145 into the reference code, didn't it?

19 A. Yes. I was constantly looking for persons who
20 could help with implementation.

21 Q. And, in fact, Thomas Wiegand, who you're familiar
22 with, correct?

23 A. Yes, he was my boss at the time.

24 Q. He e-mailed the JVT in mid-September asking for
25 someone to implement JVT-D145. Do you recall that?

1 A. I remember that, yes.

2 Q. Okay. Let's see what his e-mail said. May we
3 have RX-5218.

4 This is the e-mail from Thomas Wiegand, correct?

5 A. Yes, it is.

6 Q. Dated September 18th, 2002, correct?

7 A. Yes.

8 Q. And he said: "Let me add that Karsten informed
9 me that there is no volunteer to implement the NAL JVT-D145
10 as specified in the FCD. I think that it will be very
11 difficult to reach a stable specification without any
12 software implementation verifying it."

13 Did I read that correctly?

14 A. Yes.

15 Q. And then he says "help." In all caps at the
16 bottom, doesn't he?

17 A. Yes.

18 Q. With not one, not two, but with three exclamation
19 points, right?

20 A. There are three, yes.

21 Q. And still nobody volunteered to implement
22 JVT-D145 after this e-mail, right?

23 A. I think the e-mail that I received from Stephan
24 Wenger was on this -- around the same date.

25 Q. Let's take a look. So may we have RX-5219,

1 please.

2 So this is an e-mail from you, correct?

3 A. Yes.

4 Q. And it is dated September 27th, 2002?

5 A. Yes.

6 Q. And it says, "we currently have no up-to-date
7 high-level syntax implementation in the reference software.
8 We also still need an implementer for the output of the
9 high-level syntax breakout group at the Klagenfurt meeting.

10 Did I read that correctly?

11 A. Yes.

12 Q. So this is after the e-mail we just looked at
13 from Thomas Wiegand, the JVT still did not have somebody who
14 volunteered to implement JVT-D145 into the reference code,
15 right?

16 A. Yeah, I think I had an e-mail from Stephan saying
17 that he could take it, but probably it was not that I
18 interpreted it that he would be really working on it.

19 Q. And Stephan Wenger ultimately volunteered to
20 implement JVT-D145 into the reference code, right?

21 A. Yes, he did.

22 Q. Now, at this time, he didn't work at Nokia
23 either, did he?

24 A. As far as I know, he didn't.

25 MR. KLEIN: I pass the witness, Your Honor.

1 MS. DUCCA: No questions from Staff, Your Honor.

2 JUDGE ELLIOT: Very well.

3 MR. NEWCOMER: May I proceed with a few questions
4 on redirect?

5 JUDGE ELLIOT: Very well.

6 REDIRECT EXAMINATION

7 BY MR. NEWCOMER:

8 Q. Counsel for the Respondents put on the screen
9 CX-7169. If I could have you pull that up, Mr. Moreno, or
10 if Respondents, whoever's video tech is able first.

11 This is the e-mail from Dr. Wang on August 18th,
12 2002. Do you recall talking about this just a few minutes
13 ago?

14 A. Yes.

15 Q. And what did you understand him to be asking in
16 this e-mail and why?

17 A. So he is asking for a scheduling order for the
18 documents that were directly adopted into the standard that
19 he proposed to go before something else.

20 Q. And as part of your job, after you received this
21 e-mail, did you stop trying to implement JVT-D145?

22 A. No, I did not.

23 Q. Why not?

24 A. Because it was on the list of adoptions and
25 everything that was adopted at the meeting ultimately needed

1 to be implemented. And if that didn't happen, either at the
2 next meeting somebody would have been identified to actually
3 do the work or the technology would have been removed from
4 the standard.

5 Q. And so what was your job then from that point in
6 terms of actually getting it implemented?

7 A. So I tried to contact people and further asked
8 for the implementation. I especially also ordered the
9 reflector and as you saw in the e-mail from Dr. Weigand,
10 also asked for his help to ask.

11 Q. And we saw an e-mail from Dr. Weigand, but that
12 was prompted by you, right? He said you informed him that
13 you needed someone to do that, right?

14 A. Yes.

15 Q. And then you actually found someone, right,
16 Dr. Wenger?

17 A. Yes, Dr. Wenger took over.

18 Q. And he did implement the JVT-D145, right?

19 A. Yes, he did.

20 Q. And did you ever tell anyone, did you ever hear
21 anyone say I don't want JVT-D145 implemented?

22 A. Nobody said that to me.

23 Q. Did you ever understand you should take it off
24 your implementation schedule?

25 A. No, it was obvious on the schedule.

1 Q. And while you were responsible for bringing it to
2 fruition, did you ever stop working to do that?

3 A. Can you say again?

4 Q. Sure. While you were responsible for bringing
5 the D meeting code into the reference software, did you ever
6 stop ensuring that it would be implemented?

7 A. No, I never stopped.

8 Q. Thank you.

9 MR. NEWCOMER: No further questions.

10 JUDGE ELLIOT: Very well. Mr. Suehring, thank
11 you very much.

12 THE WITNESS: Thank you.

13 (The witness stood down.)

14 JUDGE ELLIOT: Who is next?

15 MR. HAYNES: Your Honor, our next witness will be
16 Dr. Kia. Give us a moment to pass out binders.
17 Whereupon--

18 OMID KIA,
19 having been first duly sworn/affirmed, was examined and
20 testified as follows:

21

22 THE WITNESS: I do.

23 MR. FRIST: Your Honor, may I proceed?

24 JUDGE ELLIOT: Well, do you have everything
25 distributed? People are just changing seats.

1 MR. FRIST: I believe it has all been distributed
2 or settling down now.

3 JUDGE ELLIOT: Very well. Go ahead.

4 MR. FRIST: Thank you, Your Honor.

5 DIRECT EXAMINATION

6 BY MR. FRIST:

7 Q. Good afternoon, Dr. Kia. Can you please
8 introduce yourself?

9 A. Actually good morning, sir. My name is Omid Kia.

10 Q. Thank you for that clarification.

11 What are the two patents that you analyzed in
12 this investigation, Dr. Kia?

13 A. I analyzed the '818 and the '321 patents.

14 Q. Before we get into your opinions about those two
15 patents, can we talk briefly about your qualifications?

16 A. Yes, sir.

17 Q. Now, if you look at slide 3, does this slide
18 accurately summarize your CV?

19 A. Yes, sir, it does.

20 Q. Where did you get your Ph.D. from, Dr. Kia?

21 A. I received my Ph.D. in electrical engineering
22 from the University of Maryland at College Park.

23 Q. What was your Ph.D. thesis in?

24 A. It was document image compression analysis.

25 Q. After you graduated with your Ph.D., where did

1 you go to work?

2 A. I went to work at NIST, that's the National
3 Institute of Standards and Technology, part of the U.S.
4 Department of Commerce.

5 Q. And did your work at NIST involve video coding
6 and image processing?

7 A. Oh, a lot of that. My group was called
8 Multimedia and Digital Video Group.

9 Q. And while you were at NIST, did you participate
10 in the video coding standards groups?

11 A. Yes, sir, I was. I was the U.S. ambassador to
12 the MPEG standardization group. And MPEG stands for Motion
13 Picture Experts Group.

14 Q. And what was your role as the U.S. ambassador to
15 the MPEG group entail?

16 A. So I was to oversee the interest of the U.S.
17 interests, and as part of that I attended meetings. I voted
18 on proposals. I also participated in the development of the
19 reference software for that MPEG.

20 Q. And was there a particular standard within MPEG
21 that you were working on?

22 A. Yes, sir. It was MPEG-4.

23 Q. What, if any, relationship is there between
24 MPEG-4 and H.264 and H.265?

25 A. MPEG-4, part 10, is H.264, and MPEG H.2 is H.265.

1 Q. After leaving this, did you have any further work
2 that you performed related to video coding and image
3 processing?

4 A. Yes, many of them. I worked at a number of
5 startups in medical imaging, x-ray imaging that involved not
6 only imaging but video. I also worked at government
7 contracting companies that did video coding and decoding for
8 ideas such as remote sensing and surveillance, where a video
9 is transmitted to the war fighter to support their mission.

10 MR. FRIST: Your Honor, at this time Nokia offers
11 Dr. Kia as an expert in the field of electrical engineering,
12 video coding and image processing, including the subject
13 matter of the '818 and '321 patents?

14 JUDGE ELLIOT: Very well.

15 BY MR. FRIST:

16 Q. Dr. Kia, did you assess what the level of
17 ordinary skill in the art is for the '818 and '321 patents?

18 A. Yes, sir, I did.

19 Q. What is that level of ordinary skill in the art?

20 A. The level of ordinary skill in the art is a
21 Bachelor's degree in electrical engineering, computer
22 engineering, or a related field with about two years of
23 experience in video coding or encoding technologies.

24 More work or practical experience may qualify one
25 not having the requisite education as a person with ordinary

1 skill in the art while a higher level of education could
2 offset less experience.

3 Q. Do you understand that Respondents have proposed
4 a slightly different definition?

5 A. Yes, I understand they did.

6 Q. If Respondents' definition is applied in this
7 case, would it change any of your opinions?

8 A. No, it would not.

9 Q. Dr. Kia, as of the filing dates of the '818 and
10 '321 patents, did you meet or exceed these proposed
11 definitions of an ordinary skill in the art?

12 A. I met these definitions and I far exceeded them
13 at the time.

14 Q. Dr. Kia, can we jump into the patents and start
15 with your opinions on the '818 patent.

16 A. Yes, sir, we can.

17 Q. Who were the inventors on the '818 patent?

18 A. The inventors are Drs. Miska Hannuksela and
19 Ye-Kui Wang.

20 Q. What was the '818 patent filed?

21 A. It was filed on April 30th, 2003.

22 Q. Dr. Kia, did you prepare a couple slides to
23 illustrate the background of the '818 patent?

24 A. Yes, sir, I did.

25 Q. Let's go to slide 6.

1 Slide 6, do you see an image of a video sequence?

2 A. Yes, sir, I do.

3 Q. And the callout that you have labeled picture and
4 with a couple of slices?

5 A. Yes, sir.

6 Q. What is a slice?

7 A. So in a video sequence, a single frame denoted by
8 the green box is divided into multiple areas, which are
9 called slices.

10 Q. What is the purpose of dividing a picture into
11 multiple slices in video coding?

12 A. So that the processing of the frames do not have
13 to process the entire frame at a time. You just chop it
14 down to smaller pieces.

15 Q. How many slices can there be within a picture in
16 video coding?

17 A. You can have as many slices as you like. You can
18 have one slice, two slices, three slices, four slices, any
19 amount of slices you would like.

20 Q. Have you heard the term "raw data" used in the
21 context of video coding?

22 A. Yes, sir, I do.

23 Q. What is raw data?

24 A. So the raw data is usually the data that comes
25 out of the camera. It is uncompressed. It is in a

1 rectangular format containing pixels and, yeah, just forms
2 the image from raw data.

3 Q. Have you heard the term "parameter" used in video
4 coding?

5 A. Yes, sir, I have.

6 Q. What is a parameter?

7 A. So during the compression of video, certain
8 compression techniques are used and certain parameters need
9 to be computed and transmitted just so that when the decoder
10 receives it, it can undo the compression and get to the
11 image. So whatever the encoder does, the decoder has to
12 undo it. And the parameters help it do that.

13 Q. Thank you, Dr. Kia. Let's turn to slide 7.

14 Dr. Kia, do you see the callout from the '818
15 patent with the sentence that says "video communication
16 systems can be divided into conversational and
17 non-conversational systems"?

18 A. Yes, sir, I do.

19 Q. What is a conversational system?

20 A. So a conversational system is like a two-way
21 communication, it's like a telephone but with video. So
22 what I'm showing at the top right is a video
23 teleconferencing, where a user is interfacing with 12 other
24 users. In this scenario, there is 12 different streams
25 going back and forth.

1 Q. What's a non-conversational system?

2 A. A non-conversational system is one way. So when
3 you are getting streamed a video to your device, or we have
4 a DVD, it is a one-way direction of data being decoded.

5 Q. Do conversational and non-conversational systems
6 require different parameters to be efficiently coded?

7 A. Yes, they do.

8 Q. And can you explain the different demands on the
9 types of parameters that would be needed for a
10 conversational system like video conferencing versus a
11 non-conversational system like playback of a DVD?

12 A. Sure. Of course. So with the conversational
13 system, as I have shown in the callout, each one of those
14 participants may be using different types of computers with
15 different capability in terms of processing. They may be
16 using different cameras using different resolutions and the
17 parameters that are used to compress those video streams may
18 be different.

19 So every one of those boxes in the conversational
20 system could be using different parameters. And as a
21 speaker in the video conference comes to full screen, the
22 parameter may change from the decoder side of the person
23 that is attending the meeting, whereas the
24 non-conversational, it is based on what the decoder -- what
25 the encoder decides to implement for the parameters.

1 Q. Thank you, Dr. Kia.

2 If we can turn to slide 8, which includes an
3 excerpt from column 6 of the '818 at the bottom.

4 Do you see that?

5 A. Yes, sir, I do see that.

6 Q. And if we read it together, do you see where it
7 says "it is likely that the number of picture parameter sets
8 is larger than the number of sequence parameter sets and the
9 frequency of updating picture parameter sets is higher than
10 the frequency of updating sequence parameter sets. Thus, if
11 there were a single parameter set structure, many
12 sequence-level parameters that remain unchanged in the
13 previous picture parameter set (in decoding order) should be
14 repeated."

15 Do you see that?

16 A. Yes, sir, I do see that.

17 Q. What is the single parameter set structure that's
18 referred to in that part of the '818 patent?

19 A. It is referring to a proposal that is actually
20 highlighted at the top part. It shows VCEG-N-55 but that is
21 a typo. This is VCEG-N52. In that proposal, they proposed
22 a single parameter set structure that included both sequence
23 parameter sets and picture parameter sets.

24 Q. What is the problem with a design that includes
25 all of the sequence parameter sets and the picture parameter

1 sets in a single structure?

2 A. So the problem is that once a single parameter in
3 one of those sets are changed so the entire parameter set
4 needs to be transmitted.

5 Q. Dr. Kia, let's jump to slide 9 which has a
6 callout from column 4 of the '818 patent.

7 How did the inventors propose solving the
8 problems associated with the single parameter set structure?

9 A. So they taught a method of separating the
10 parameters, based on a rule that they came up with which is
11 the persistency and target of parameters. So based on how
12 often parameters change and where they belong, they split
13 the parameters in its rightful place. And that's what I
14 have highlighted at the bottom.

15 So they propose to put the parameters that are
16 very, how can I say this, non-persistent, they change a lot,
17 into the slice. So this slice always has to have a header,
18 whatever changes allowed goes in there.

19 The next set of parameters which may change but
20 is unlikely to change goes into what's called the picture
21 parameter set.

22 And the parameters that are not going to change,
23 the most persistence of all will go into the sequence
24 parameter set.

25 Q. So, Dr. Kia, just to focus on the top sentence

1 here that is highlighted in yellow where it says "the
2 present invention splits the parameter set structure."

3 What's the benefit of that?

4 A. So when you split the parameter set into a
5 picture parameter set and the sequence parameter set to two
6 parameters, then if a parameter in one set is changed, you
7 don't have to send both sets. You only send the one set
8 that it changed in.

9 Q. Thank you, Dr. Kia. Let's jump to slide 10.

10 Dr. Kia, can you explain how slide 10 shows the
11 benefit of the split parameter structure of the '818 patent
12 as compared to the single parameter structure?

13 A. Yes, sir. So what I have on the top is a single
14 parameter set structure. Those are actual parameters at the
15 time where the decoder would need to use to decode a video.
16 And if all of those parameters were to go into one parameter
17 set, I identified 96 parameters.

18 Now, if I split that into what picture parameter
19 sets would be, there would only be 45. So in the prior art
20 if one of the elements of the picture parameter set were to
21 change, I have to send all 96. But if I only use a picture
22 parameter set and a sequence parameter set, if I change one
23 of the elements of the picture parameter set, I only need to
24 update 45.

25 Q. And what's a context where the picture parameter

1 set parameters would be changing frequently but the sequence
2 parameters would not?

3 A. Yeah. So that's when the picture parameter sets
4 might change more frequently, such as the conversational
5 system.

6 Q. And the conversational systems that you mentioned
7 earlier is like video conferencing; is that correct?

8 A. That's correct.

9 Q. And if we can go to slide 11, Dr. Kia.
10 Do you see in slide 11 the callout from Figure 1
11 of the '818 patent?

12 A. Yes, sir, I do see that.

13 Q. Does the Figure 1 illustrate the split parameter
14 sets of the '818 patent?

15 A. Yes, sir, it does.

16 Q. And what are the parameter sets that you have
17 highlighted in blue in Figure 1?

18 A. What I have highlighted is the sequence parameter
19 set, which is called out as the independent GOP parameter
20 set. It is just another word for it. And I have also
21 highlighted the picture parameter set highlighted in green.

22 Q. So the sequence parameter sets are in blue and
23 the picture parameter sets are in green; is that correct?

24 A. That's correct.

25 Q. What have you highlighted in orange on Figure 1?

1 A. Yeah. So those are slices. Slices are the slice
2 headers and slice data.

3 Q. And so the slices in orange, is that where the
4 raw data is that's being compressed?

5 A. So those are the coded data that has been
6 compressed and the data that is in there representative of
7 the pictures.

8 Q. Does Figure 1 illustrate additional parameter
9 sets beyond the sequence parameter set and picture frame
10 reset?

11 A. Yes, it does.

12 Q. What other sets are illustrated in Figure 1?

13 A. Figure 1 also shows a slice parameter set and a
14 presentation parameter set.

15 Q. Does the invention of the '818 patent limit the
16 number of parameter sets that can be used?

17 A. No, it does not.

18 Q. If you look at the quote from column 4 at the
19 bottom left of this screen, it says "according to the
20 invention, there exists at least two kinds of parameter
21 sets; one for the sequence (sequence parameter set) and one
22 for the pictures (picture parameter set)."

23 Do you see that?

24 A. I do see that.

25 Q. How does the reference to at least two kinds of

1 parameter sets inform your opinion whether the '818 patent
2 is targeted towards split structures that can have more than
3 two parameter sets?

4 A. Yeah. So the language that exists, at least two,
5 confirms in my opinion that the parameter set is to be
6 split, and it can have more than two but at least two.

7 Q. Is the disclosure in column 4 consistent with the
8 prosecution history?

9 A. Yes, it is. It says the same thing.

10 Q. And do we see that here at the bottom right where
11 it says that improvements of the invention, present
12 invention are mainly the separation of parameter sets to
13 more than one category?

14 A. That's correct. That's saying it just another
15 way. It's just more than one.

16 Q. And according to the '818 patent, are there two
17 parameter sets that must be present in this split structure?

18 A. Yes, sir, there is.

19 Q. What are those?

20 A. Those are the picture parameter set and the
21 sequence parameter set.

22 Q. Let's turn to slide 12.

23 Do the claims of the '818 patent cover the
24 embodiment disclosed in Figure 1?

25 A. Yes, sir, it does.

1 Q. And how would you illustrate that on slide 12?

2 A. So the way I have illustrated it is claim element
3 6B requires a sequence parameter set. And that parameter is
4 highlighted in blue as well in Figure 1; whereas the
5 independent GOP parameter sets, just another name for a
6 sequence parameter set, claim element 6C requires a picture
7 parameter set highlighted in green.

8 I have highlighted picture parameter set in the
9 figure, claim element 6D and 6E require slice header. Those
10 are the orange highlights and the orange boxes in Figure 1.

11 Q. Dr. Kia, were you in the courtroom for
12 Dr. Suehring's testimony just before you took the stand?

13 A. Yes, sir, I was.

14 Q. And you understand that Dr. Suehring provided a
15 lot of testimony about development during the H.264
16 standardization process?

17 A. Yes, sir, I was.

18 Q. Does that story that Dr. Suehring provided go to
19 the issue of conception and reduction to practice for the
20 '818 patent?

21 A. Yes, sir, it does.

22 Q. And did you analyze the evidence related to
23 conception and reduction to practice for the '818 patent?

24 A. I did.

25 Q. Now, do you understand that Respondents have

1 taken the position that there is no document prior to the
2 '818 patent that evidences that the inventors conceived of
3 the invention of the '818 patent?

4 A. I understand that's what they are saying.

5 Q. And that's after having reviewed all the
6 materials from H.264, correct?

7 A. That is correct.

8 Q. Let's go to slide 13.

9 Dr. Kia, does this slide include a comparison of
10 Figure 1 of the '818 patent and Figure 1 of one of the
11 documents you have identified as a conception document?

12 A. Yes, sir, it does.

13 Q. And the document you have identified as a
14 conception document is JVT-C078, right?

15 A. That's correct.

16 Q. That's a document that was submitted to H.264
17 during standardization process, right?

18 A. That's correct.

19 Q. What if any difference at all is there between
20 Figure 1 of the '818 patent and the document you have
21 identified as the conception document?

22 A. There is no difference. They are identical.

23 Q. Have Respondents argued that these figures are
24 different?

25 A. No.

1 Q. Now, Dr. Kia, did you prepare a timeline to help
2 us understand the full story about conception and reduction
3 to practice?

4 A. Yes, sir, I have.

5 Q. Let's turn to slide 14. Does this include your
6 timeline?

7 A. Yes, sir, it does.

8 Q. Can we start on the left, you have two dates, May
9 1st and April 27th, 2002. Is that right?

10 A. That's correct.

11 Q. And you have cited two documents, JVT-C078 and
12 JVT-Cxxx; is that right?

13 A. That's correct.

14 Q. What are those documents?

15 A. JVT-Cxxx and the annex with the date April 27th,
16 so that's a draft proposal prepared by Drs. Hannuksela and
17 Wang prior to their submission to the JVT standards body for
18 consideration.

19 I have verified the dates by the cover, the
20 actual document itself and also the metadata. JVT-C078 plus
21 the annex is the document that was actually submitted to the
22 JVT standards body. And it is the identical document with
23 the only difference is that they received a number for
24 submission and filled out some of the other fields.

25 Q. Now, Dr. Kia, we're going to walk through those

1 documents in a little more detail but I want to make sure we
2 complete our timeline first.

3 The next event in the timeline is July 26th,
4 which you have labeled as reduction to practice. Is that
5 right?

6 A. That's correct.

7 Q. And the document you have labeled here as
8 JVT-D145. Is that right?

9 A. That's correct.

10 Q. And do you recall Dr. Suehring testifying quite a
11 bit about JVT-D145 in his testimony?

12 A. Yes, sir, I heard that.

13 Q. What is the relationship between JVT-D145 and the
14 documents you have identified as -- for conception?

15 A. The JVT-D145 captures the elements that Drs.
16 Hannuksela and Dr. Wang proposed during conception.

17 Q. What occurred in the standards meetings between
18 the May 1st and July 26th time frame?

19 A. There were two standards meetings. And the
20 process of proposing a proposal, taking votes, and talking
21 amongst the experts themselves to understand what the
22 proposal is and how best it would serve the community.

23 Q. What is your understanding of what Dr. Hannuksela
24 and Dr. Wang did in between May 1st through July 26th to
25 push their idea of this split parameter set architecture

1 into the standard?

2 A. Yeah, they diligently argued that the proposal
3 that it has value and how it would solve the problems.

4 Q. And do you understand that in the JVT-D145, that
5 Dr. Hannuksela and Dr. Wang's idea was incorporated into the
6 H.264 standard?

7 A. Yes, that's what it is.

8 Q. Now, at the bottom of this slide under JVT's
9 adoption of the '818 patent you have a number of, about four
10 or five exhibits cited. Do you see that?

11 A. I do see that.

12 Q. What are those exhibits?

13 A. So those are some logs that Drs. Hannuksela and
14 Dr. Wang provided to their employer of the update of what
15 their efforts are, there are some e-mails, there are some
16 other documents. There is even the draft H.264 standard.

17 Q. And let's go to the final date. Do you see the
18 December 18th date?

19 A. Yes, sir, I do see that.

20 Q. That's December 18th, 2002, right?

21 A. That's correct.

22 Q. What occurred on December 18th, 2002?

23 A. As Dr. Suehring mentioned, that's when the
24 reference code was done, implementing the sequence parameter
25 set and the picture parameter set.

1 Q. And why is it your opinion that the reference
2 code is a reduction to practice of the '818 patent?

3 A. Because the ideas that was conceived of earlier,
4 now it is actually working. It is implemented decoding the
5 video and using the benefits that it provides.

6 Q. And --

7 JUDGE ELLIOT: Mr. Frist, I'm sorry. I would
8 like to take our lunch break sometime in the next few
9 minutes.

10 MR. FRIST: Any time you would like to, Your
11 Honor. We can do that now, if you like.

12 JUDGE ELLIOT: Very well. I have 12:16. Let's
13 come back at 1:30, 1:30. And during our break, sir, please
14 don't discuss your testimony with anyone.

15 (Whereupon, at 12:15 p.m., a lunch recess was
16 taken.)

17

18

19

20

21

22

23

24

25

1 A F T E R N O O N S E S S I O N

2 (1:30 p.m.)

3 JUDGE ELLIOT: Have a seat. All right.

4 MR. FRIST: May I proceed, Your Honor?

5 JUDGE ELLIOT: Yes.

6 BY MR. FRIST:

7 Q. Welcome back from lunch, Dr. Kia. Before the
8 break, do you recall, we were discussing the conception and
9 reduction to practice timeline?

10 A. Yes, sir, I do.

11 Q. And focusing on the period from the JVT-D145
12 document and the reference code being written, do you have
13 an opinion regarding whether the time it took to implement
14 that code was reasonable?

15 A. Yes. It's my opinion that it was reasonable.

16 Q. And what's the basis for your opinion?

17 A. Well, based on the communication I've seen
18 through e-mails and the software coordination documents that
19 Mr. Suehring presented, also when I was in the MPEG-4
20 reference software design, this is how things were done.

21 Q. Now, when reference code for a standard is
22 published, is that a major milestone in the development of
23 the standard?

24 A. Yes, sir, it is.

25 Q. And why is that?

Heritage Reporting Corporation
(202) 628-4888

1 A. Well, that's because a version of the standard
2 that is now workable is available, and the experts that
3 contributed to it can now use it and analyze it.

4 Q. Do you have an opinion regarding whether the
5 inventors would have been aware that the '818 patent
6 invention was implemented in the reference code and worked
7 for its intended purpose?

8 A. Definitely, they would be. They would know.

9 Q. And why is that?

10 A. Well, they were in the e-mail list, they are
11 involved in other aspects of the standard. They would know.

12 Q. Thank you, Dr. Kia. If we can go to slide 15.

13 Dr. Kia, you've added some callouts to your
14 timeline. Can you explain what those callouts are?

15 A. Absolutely. The three callouts on the left are
16 the metadata for the documents that I saw. And they match
17 exactly to the timeline that I provided. These are
18 Microsoft.doc documents that have the metadata. And on the
19 far right, it's the timestamp for the actual reference code
20 that confirms the December 18th time.

21 Q. So does the metadata and file date pass, or
22 whatever that's on the right, confirm that the dates you
23 have on this timeline are accurate as to the documents?

24 A. Yes, sir, they're the same dates.

25 Q. All right. Do you understand that for conception

1 and reduction to practice, we need to walk through the claim
2 elements and show where those elements are disclosed in
3 these documents?

4 A. Yes, sir, I do.

5 Q. Okay. Let's start that process. If we can go to
6 slide 16.

7 Focusing first on the requirement of elements 6A,
8 15A, and 15B, how does the conception documents disclose a
9 decoder for decoding sequences of pictures?

10 A. So the requirement is decoding sequences using
11 parameter sets and slices. So the conception talks about
12 coding of parameter sets. It describes a decoding process.
13 It describes receivers that does the decoding and also talks
14 about slices.

15 Q. And to make sure the record is clear, when I'm
16 referring to the conception documents, will you understand
17 that I'm referring to JX-0481 and JX-0475?

18 A. Yes, sir, I do.

19 Q. And so where on the conception documents are you
20 pointing to for the disclosure of a parameter set and
21 slices?

22 A. So I'm pointing to the JVT-Cxxx, and it talks
23 about -- at page 7, that it talks about those elements.

24 Q. And so if we look at the title of the conception
25 document, is it Coding of Parameter Sets?

1 A. Yes, sir, that's what it says.

2 Q. There's a disclosure in the conception documents
3 of a first slice of the next picture, right?

4 A. That's correct.

5 Q. How did the reduction to practice of the
6 reference code implement the features described in the
7 conception documents as to elements 6A, 15A, and 15B?

8 A. So the reference software includes a file that
9 has comments that says the sequence and picture parameter
10 sets are one of the changes. It's in the changes.text file.
11 And also in a source code file, it sets up the slice, what
12 I've highlighted in orange.

13 So it defines what the slice is. And it also
14 says that it is decoding frame slice and decodes field
15 slice. So it's performing the decoding of parameter sets
16 and slices.

17 Q. Would the reference code that's shown on this
18 slide run on a processor?

19 A. Yes, sir, and it has to.

20 Q. Let's go to slide 17. And I'd like to focus on
21 elements 6B and 15C first.

22 How does the conception documents disclose
23 recognizing a sequence parameter set and forming at least
24 one sequence parameter pertaining to a sequence using the
25 parameter set?

1 A. Sure. So the conception document has a section
2 on an exemplar sequence parameter set, what I've highlighted
3 in blue. It says independent GOP parameter set, which is a
4 sequence parameter set. And it includes examples of
5 parameters that are inside it, which needs to be parsed and
6 stored for the decoding process to follow.

7 Q. What's an example of a parameter that's formed
8 according to the conception documents for the independent
9 sequence parameter set?

10 A. So one of the examples is
11 log2_max_picture_number_minus4.

12 Q. And how do -- shifting to elements 6C and 15D,
13 how do the conception documents disclose recognizing in the
14 decoder a picture parameter set and forming at least one
15 first picture parameter value pertaining to a picture using
16 the parameter set?

17 A. So what I'm showing in the reference software is
18 a function called interpret SPS. SPS stands for sequence
19 parameter set. This is taking input, a variable that is
20 called seq_parameter_set_RBSPT, which is the sequence
21 parameter set.

22 And in that function, the SPS variable is being
23 populated. As one of the examples, one of the lines in the
24 code is actually the same parameter that I just mentioned in
25 the conception document, which is the

1 log2_max_frame_num_minus4.

2 Q. How does the reference code show that the
3 features of the conception documents were implemented and
4 reduced to practice?

5 A. It shows that the same ideas that were proposed
6 in the conception document is included in the reference
7 software.

8 Q. And could you identify the variable that
9 identifies the sequence parameter set?

10 A. Yes. It would be the log2_max_frame_num_minus4
11 variable.

12 Q. And what are the parameters for the picture
13 parameter set?

14 A. So the picture parameter set is what I've
15 highlighted in the green. In the conception document, it is
16 the picture parameter set, and as example they have the
17 picture width in MB minus 1, picture height in MB minus 1 as
18 the parameters.

19 Q. Thank you, Dr. Kia. Let's jump to the next
20 elements.

21 Do you see on the screen elements 6D, 15E, 6E,
22 and 15F?

23 A. Yes, sir, I do.

24 Q. And 6D and 6E are identical to 15E and 15F, other
25 than the reference to a decoder, correct?

1 A. That's correct.

2 Q. How do the conception documents disclose the
3 second picture parameter value of these claim elements?

4 A. The conception document includes a description of
5 the slice header, and the slice header is where some of
6 these variables are stored. So it talks about the picture
7 number, which is the same thing as a frame_num. And it says
8 that the picture number serves as a unique ID for each
9 picture. So for each picture, this number would change.

10 But if you put this in the picture parameter set,
11 you would have to transmit the parameter set all the time.
12 So this goes in the slice header, not in the picture
13 parameter set.

14 And it also talks about using this parameter in
15 the decoding process whereby, as an example, it says a
16 decoder which encounters a picture number that has already
17 decoded the picture with that same picture number is an
18 error and that it should treat this condition as an error.

19 Q. Thank you, Dr. Kia. I think you got a little
20 ahead of me. We covered most of elements 6D and 6E. So let
21 me just make sure it's clear on the record.

22 Do you have an opinion whether 6D, 6E are
23 disclosed in the conception documents?

24 A. Yes, it is my opinion that it is.

25 Q. Is the explanation you just gave the

1 justification for that?

2 A. Yes, sir.

3 Q. Okay. Now, focusing on the reduction to practice
4 in the reference code, how does the reference code show that
5 the features that you just walked through related to slice
6 headers and picture numbers were implemented in the
7 reference code?

8 A. Sure. So in the reference software, the function
9 rest of slice header is where the information from the slice
10 header is being parsed. So image arrow frame_num is equal
11 to siminf, is that's where it reads the frame number from
12 the slice header.

13 And elsewhere in the code, we see that that same
14 structure, image frame_num, is being used to calculate other
15 variables. It also says that it's calculating expected
16 delta per pic_order_count cycle. So this is a process that
17 is using the frame number variable.

18 Q. Thank you, Dr. Kia. If we can go to slide 20.

19 All right. Go to slide 21. Focus on claim 8.

20 Does the -- do the conception documents disclose
21 that the inventors had conceived of claim 8?

22 A. Yes, they did.

23 Q. And can you explain your opinion?

24 A. Absolutely. So claim 8 is a dependent claim,
25 additional requirement that the sequence parameter set ID is

1 included in the picture parameter set. And what I have
2 shown on the left is the syntax of the picture parameter
3 set. As I've highlighted in blue, it includes the parameter
4 set ID, which is the independent GOP parameter set. It's
5 another word for sequence parameter set.

6 Q. And how did the reference code implement the
7 picture parameter set syntax with those elements?

8 A. So -- yeah, so what I show on the right is the
9 file where the structure of picture parameter set RBSVT,
10 that's the green highlight at the very bottom, includes a
11 variable that's called seq_parameter_set_id. So that
12 follows the same guideline.

13 Q. Thank you, Dr. Kia. Let's go to claim 9.

14 How do the conception documents show that the
15 inventors had conceived of the additional limitation that
16 the second picture parameter value is selected from a group
17 of information of a picture_order_count and a frame_number?

18 A. So they talk about a temporal reference, which is
19 another word for picture_order_count. This is how the
20 pictures are to be displayed. And they also talk about a
21 picture number, which is another name for frame_number.

22 Q. And how does the reference code sections that
23 you've highlighted in slide 22 show that the reference code
24 implemented those features into the final version?

25 A. So what I'm showing in the source code is, within

1 the slice structure, it includes the top POC, which is the
2 picture_order_count. And it also includes a frame_num.

3 Q. Thank you, Dr. Kia.

4 Backing up to slide 20, do you understand that
5 Respondents take issue with the conception documents because
6 of the disclosure of four parameter sets versus two
7 parameter sets?

8 A. Yes, that's my understanding as what they are
9 saying.

10 Q. And we talked earlier, but do the claims limit
11 the scope of the claims to only two parameter sets?

12 A. No, it doesn't.

13 Q. Okay. Did you look, however, in the conception
14 documents to see if there was an example where only two
15 parameter sets would be used?

16 A. Yes, I did.

17 Q. And can you explain, based on the excerpts from
18 the conception documents, for example, 2.10, how that
19 informs your opinion regarding an example of two parameter
20 sets?

21 A. Absolutely.

22 MR. KLEIN: Objection, Your Honor, outside the
23 scope.

24 JUDGE ELLIOT: Hold on.

25 MR. FRIST: Your Honor --

1 JUDGE ELLIOT: Okay. Go ahead.

2 MR. FRIST: Your Honor --

3 JUDGE ELLIOT: Yes, Mr. Frist, go ahead.

4 MR. FRIST: Thank you, Your Honor. First, two
5 issues. We provided this slide last night and were
6 expecting objections to this slide before today, and there
7 were no objections raised as to this slide. And it's clear
8 we're talking about conception and these documents, so I
9 believe the objection has been waived. But if I can get the
10 ELMO as well.

11 JUDGE ELLIOT: So your objection is it's outside
12 the scope of his expert report; is that right?

13 MR. KLEIN: Yes, Your Honor.

14 JUDGE ELLIOT: Hold on. All right. Well,
15 Mr. Frist, show me where he talks about this in his expert
16 report.

17 MR. FRIST: Sure. Your Honor, here there's a
18 discussion of -- this is from the expert report, from
19 Dr. Kia's expert report. It's from his opening expert
20 report. And he is talking about elements 1B and 1C, which
21 relate to these two parameter sets, and showing that there
22 are -- the two parameter sets that are disclosed and points
23 to this exact same part of the document that we've
24 highlighted.

25 And, in particular, if you look at the bottom of

1 element C, there's a reference to page 9, where he says,
2 "The following picture parameter set is coded and conveyed."
3 And if you look at the slide I was just showing, it's
4 pointing to that exact same part of the document in evidence
5 where it's says the parameter set was coded and conveyed.
6 So I think it's expressly disclosed here.

7 I can bring back the slide if you'd like, Your
8 Honor.

9 JUDGE ELLIOT: Okay. Hold on. I need to review
10 the previous testimony.

11 Okay. Well, the question is about two versus
12 four parameter sets. And I don't see anything in here about
13 multiple parameter sets on what you're showing me on the
14 screen, page 37 of his opening report.

15 MR. FRIST: Your Honor, if I may explain? Sorry.
16 I didn't mean to take it away from you.

17 JUDGE ELLIOT: Can you give me some more detail,
18 please?

19 MR. KLEIN: Yes, Your Honor. The number of
20 parameter sets, four versus two, is a very important issue
21 in this case. And Respondents have always maintained that,
22 that the inventors had only conceived of this four specific
23 -- this four frame of architecture in their conception
24 documents. And Complainants have never advanced the theory
25 that the conception documents show anything less than using

1 that very specific four parameter set structure.

2 Now, Dr. Kia is going to change that and talk
3 about, oh, they actually conceived of having two parameter
4 sets in the structure. They've never disclosed that theory
5 before.

6 JUDGE ELLIOT: Mr. Frist, I don't see this in
7 what you're showing me.

8 MR. FRIST: Your Honor, I can rephrase the
9 question, but let me -- can I explain where the testimony
10 was going --

11 JUDGE ELLIOT: Go ahead.

12 MR. FRIST: -- then I think I can reframe it,
13 instead of the two versus four distinction. The two versus
14 four distinction is one that Respondents have raised that
15 they think the claims somehow only read on two parameter
16 sets and wouldn't read on a scenario where you have four
17 parameter sets. We disagree with that. We've already
18 covered that with Dr. Kia earlier, that the claims are broad
19 enough to have two or more.

20 And here in the conception documents, what
21 Dr. Kia -- the conception chart, Dr. Kia was walking through
22 element 1B -- sorry, 6B and 6C to show where the evidence of
23 the two sets are. The first set is the picture sequence
24 parameter set, and the second set is the picture parameter
25 set. And the evidence he pointed to, to show that those

1 sets are recognized, formed, and included in the bitstream,
2 is -- includes this cite on page 9, for example, where it
3 says, "The following picture parameter set is coded and
4 conveyed."

5 And in the slide, the highlighting is directly to
6 that quote. If we look on page 9, the part we've
7 highlighted is independent GOP parameter set is coded and
8 conveyed. Picture parameter set encoded and conveyed.

9 And all Dr. Kia is going to testify to is that
10 the document disclosed an example where those two sets are
11 coded and conveyed. And there's nothing else that's
12 discussed. So I think it's entirely consistent with his
13 disclosure of 1B and 1C. But I don't have to use the words
14 "four" and "two" in my question if that's the problem.

15 JUDGE ELLIOT: All right. I'm going to overrule
16 this objection because, sitting here right now, it occurs to
17 me that it may be -- this may be one of these situations
18 where you have additional features like four parameter sets
19 instead of just two, and that as long as you have at least
20 two, then you've satisfied the claim.

21 Now, maybe I'm misunderstanding the parties'
22 position, so I don't want you to think this sets some sort
23 of precedent, but I am going to overrule the objection for
24 now. Why don't you ask your question again, please.

25 MR. FRIST: Thank you, Your Honor.

1 BY MR. FRIST:

2 Q. Dr. Kia, do you see Section 2.10 that's shown
3 here?

4 A. Yes, sir, I do.

5 Q. What are the two parameter sets that are coded
6 and conveyed in example 2.10?

7 A. They are the independent GOP parameter set, which
8 is another name for the sequence parameter set, and there's
9 the picture parameter set.

10 Q. Are there any other parameter sets conveyed in
11 example 2.10?

12 A. No, they are not.

13 Q. Thank you, Dr. Kia.

14 All right. Dr. Kia, we've covered conception and
15 reduction to practice now, so I'd like to move to your
16 opinions about infringement. Is that okay?

17 A. Yes, sir.

18 Q. And to start with, I'd like to just get some
19 background about the products you've analyzed for
20 infringement. Is that okay?

21 A. Sure.

22 Q. Were you in the courtroom when Dr. Orchard
23 testified earlier?

24 A. Yes, sir, I was.

25 Q. And did you hear Dr. Orchard testify about the

1 accused Amazon and HP products in this case?

2 A. Yes, sir, I did.

3 Q. Did you analyze those same products for
4 infringement for the two patents you've provided opinions
5 on?

6 A. Yes, they're the same products.

7 Q. Okay.

8 MR. FRIST: Your Honor, I think we may need to go
9 on the third-party confidential record, as well as HP and
10 Amazon. But I think all the client reps may have to go out
11 the room for this.

12 JUDGE ELLIOT: Very well.

13 (Whereupon, the hearing proceeded in confidential
14 session.)

15

16

17

18

19

20

21

22

23

24

25

1 O P E N S E S S I O N

2 BY MR. FRIST:

3 Q. Dr. Kia, what is the title of the '321 patent?

4 A. The title is Grouping of Image Frames in Video
5 Coding.

6 Q. And who is the inventor on the '321 patent?

7 A. That's Dr. Miska Hannuksela.

8 Q. And is he one of the inventors on the '818 patent
9 that we looked at earlier?

10 A. Yes, he's one of them.

11 Q. Okay. Now, have you heard of the concept of
12 random access in video coding?

13 A. Yes, sir, I have.

14 Q. What is random access?

15 A. Random access is a process where a user
16 displaying video can fast-forward, rewind, arbitrarily set a
17 point where they want to start seeing a video.

18 Q. And does the '321 patent provide a very specific
19 solution to the random access problem?

20 A. Yes, sir, it does.

21 Q. Okay. I'd like to back up a little bit and talk
22 about a couple more core concepts from a technology
23 standpoint before we get into the invention of the '321
24 patent, okay?

25 A. Okay.

1 Q. All right. Let's jump to slide 52. And on the
2 title of this slide is Temporal Redundancy.

3 Do you see that?

4 A. I do see that.

5 Q. What is temporal redundancy?

6 A. Temporal redundancy is a concept where,
7 throughout the number of frames that come one after the
8 other as the word "temporal," that there's redundant content
9 within those frames.

10 Q. So what are you illustrating with these red boxes
11 at the top of each frame in this slide?

12 A. What I'm representing is that the frames that
13 come one after the other, that section of the frame remains
14 unchanged. They are redundant.

15 Q. And how can a video encoder or video coding
16 techniques take advantage of this temporal redundancy to
17 improve compression?

18 A. Well, they do prediction. So instead of encoding
19 the image data within the redundant parts, they just point
20 to one reference picture that has the data. And they say
21 just use that data and not encode additional picture data.

22 Q. And do you recall earlier today Dr. Orchard
23 described prediction in quite a bit of detail? Do you
24 recall that?

25 A. I do recall that, yes.

1 Q. Okay. Let's touch briefly on it just to reset
2 the stage. Let's turn to slide 53.

3 Can you explain how prediction is used in this
4 very simple scenario?

5 A. Yes. So instead of encoding the area which I
6 have with the dashed red rectangle, you refer back to
7 another picture that actually has that image data. So
8 instead of recording that region from raw data, you say that
9 just use the previous frame for image data.

10 Q. And so here frame number 1, the top part of it
11 would be predicted from frame number 0. Is that what you're
12 illustrating?

13 A. That's correct.

14 Q. All right. Now, if we look at slide 54, how can
15 prediction really be used to improve compression when you
16 have lots of temporal redundancy in a sequence?

17 A. Yeah. So even with the images with the car
18 moving, that section of the image remains unchanged. So
19 instead of recording image data for each one of them, you
20 just refer to a frame that has that content. And it
21 achieves a tremendous amount of compression.

22 Q. Turn to slide 55.

23 What is a potential disadvantage of using
24 prediction?

25 A. Yeah. So if you do not have the reference

1 picture, if for some reason that reference picture is
2 missing, then the other frames that refer to it, now they do
3 not have the source to rebuild that frame. So then there
4 will be problems.

5 Q. What types of problems can exist when a picture
6 cannot identify the reference picture from which it should
7 be temporally predicting part of its image?

8 A. So they don't have the data to predict from. So
9 what I show here is just a salt-and-pepper noise.

10 Q. Okay. Let's go to slide 56.

11 And here we've kind of expanded the sequence of
12 images. Is that right?

13 A. That's correct, yes.

14 Q. And underneath the sequence of images, you've
15 added labels, group 1, group 2, and group 3. Do you see
16 that?

17 A. I do see that.

18 Q. And for two of the groups, you've labeled them as
19 independent. Is that fair?

20 A. That's correct.

21 Q. What are you referring to when you refer to this
22 independent group?

23 A. What I refer to in the independent is that the
24 frames inside the independent group only rely on the frames
25 within its group.

1 Q. So is there no temporal prediction between an
2 independent sequence and a sequence or pictures outside of
3 that sequence?

4 A. That's correct.

5 Q. And so looking at group 2 where you've labeled it
6 dependent, why have you labeled that a dependent sequence?

7 A. Well, that's because frame 5 is actually
8 referring to a frame outside of its group.

9 Q. All right. Thank you, Dr. Kia.

10 If we go to slide 57, at the top, we have an
11 excerpt from column 3 of the '321 patent where it says, "A
12 group of pictures employing reference picture selection
13 cannot necessarily be decoded independently."

14 Do you see that?

15 A. I do see that.

16 Q. Can you explain what that means?

17 A. Yes. So we were just talking about it, is that
18 in encoding, if you are employing a reference picture
19 picking which picture you're going to use as reference as
20 the source data, if that source data is outside of your
21 group, that group of pictures cannot be decoded
22 independently.

23 Q. And if we look at the excerpt at the bottom of
24 slide 57, also from column 3, is that describing the random
25 access problem we discussed before?

1 A. Yes, sir, it does. Start browsing from a video,
2 and if you start from the middle of a video transmission,
3 yeah.

4 Q. And so would an example of random access be if
5 you're going to watch a Netflix video and kind of
6 fast-forwarding to some point that you left off earlier?

7 A. That's correct.

8 Q. Okay. How is the problem identified at the top,
9 that reference picture selection means that a group of
10 pictures cannot necessarily be decoded independently, a
11 particular problem in the random access situation?

12 A. Well, that's because when there are pictures
13 referencing outside of the group, and there is no indication
14 of where an independent group starts, then that presents a
15 problem in the random access utilization.

16 Q. Let's turn to slide 58.

17 In slide 58, you're showing an example using the
18 sequence of pictures again, correct?

19 A. That's correct.

20 Q. And you've illustrated a scenario where a user
21 selects a point in the video using random access which, for
22 example, here is picture 3. Correct?

23 A. That's correct.

24 Q. If the decoder just started decoding at picture
25 3, what problems would it incur?

1 A. So when the decoder starts decoding at picture 3,
2 pictures 0, 1, and 2 are not present. They are not there.
3 So maybe picture 3 would come out fine, picture 4 would come
4 out fine, but when it reaches picture 5, that's being
5 referred to picture 0, which is nonexistent.

6 So that would present a problem. And picture 5
7 would not know how to build itself correctly.

8 Q. Does the '321 patent try and solve that problem?

9 A. Yes, sir, it does.

10 Q. Let's turn to slide 59, which includes an excerpt
11 from column 4 of the '321 patent.

12 Do you see at the top, the part in yellow says,
13 "An advantage of the procedure of the invention is that it
14 enables to start browsing a video sequence from a random
15 point"? Do you see that?

16 A. I do see that.

17 Q. That's referencing the random access problem we
18 talked about, correct?

19 A. That's correct, yes.

20 Q. And the second part says, "i.e., it provides the
21 decoder with information about the first picture of an
22 independently decodable sequence.

23 Do you see that?

24 A. I do see that.

25 Q. What is an independently decodable sequence?

1 A. Yeah, so that's a sequence where the frames only
2 refer to the frames inside that sequence, not outside of it.

3 Q. What's the benefit of the invention's disclosure
4 and feature that the decoder is provided information about
5 the first picture of an independently decodable sequence?

6 A. Well, it informs the decoder that it can start
7 decoding from a place that no problems would arise.

8 Q. Does this invention allow the decoder to choose
9 whether it finds the start of an independent sequence before
10 or after the random access point?

11 A. Yes, it does -- it can do both, yeah.

12 Q. Are there any other benefits to the design of the
13 '321 patent?

14 A. Yes. So when you reach the first image of this
15 independent sequence, the decoder can flush the other images
16 it has because it knows that it does not need to rely on any
17 other pictures.

18 Q. Thank you, Dr. Kia. Let's look at slide 60.

19 And on slide 60 is the image we were looking at
20 before, but you've added this black box indication to each
21 independent sequence. Is that right?

22 A. That's correct.

23 Q. What is that intended to illustrate?

24 A. That's intended to illustrate that that's where
25 the decoder can go to start decoding and not see any -- not

1 to enter any problems.

2 Q. So if we go to slide 61 and use our example where
3 a user selects picture 3 as its random access point, where,
4 according to the '321 patent, would the decoding potentially
5 start?

6 A. Based on the '321 patent, the decoding can start
7 either in group 1, frame 0, or in group 3, frame 0.

8 Q. If we go to slide 62, have you illustrated those
9 points with the bright green arrows?

10 A. That's correct, I have.

11 Q. All right. Dr. Kia, I'd like to do what we did
12 with the '818 patent and start marching through the claims
13 of the '321 patent. Okay?

14 A. Okay.

15 Q. At a high level -- before we do that, though, a
16 couple high-level questions. Do you have an opinion
17 regarding whether a decoder that implements the H.264
18 standard would infringe the asserted claims of the '321
19 patent?

20 A. Yes, I do. It's my understanding that it does,
21 yeah.

22 Q. So it's your understanding that a H.264 decoder
23 would necessarily infringe the '321 patent?

24 A. Yes, sir.

25 Q. Do you have an opinion regarding whether a

1 decoder that implements the H.265 standard would infringe
2 the asserted claims of the '321 patent?

3 A. The same, yes, it does.

4 Q. All right. So a H.264 decoder would necessarily
5 infringe the '321 patent?

6 A. That's correct.

7 Q. Would a decoder that implements the AV1
8 specification necessarily infringe the asserted claims of
9 the '321 patent?

10 A. Yes, sir, it does.

11 Q. Okay. Now, on the '818 we went through two
12 standards, H.264 and H.265; is that right?

13 A. That's correct.

14 Q. And here we're looking at the same standards, but
15 we're adding the AV1 specification, correct?

16 A. That's correct.

17 Q. Okay. Now, turning to the preamble of claims 8
18 and 10 of the '321 patent, do the accused products practice
19 the preambles, elements 8A and 10A --

20 A. Yes.

21 Q. -- of the '321 patent?

22 A. Yes, they do.

23 Q. Can you explain, first, how the H.264 standard
24 would require a decoder to include the features of the
25 preamble?

1 A. So the H.264 standard specifies a decoder that
2 performs a decoding process. And that decoding process
3 needs to operate on a processor that has at least a memory
4 and computer code.

5 Q. And how does the H.265 standard require that an
6 H.265 decoder implement the features of elements 8A and 10A?

7 A. So, similarly, H.265 specifies a decoder that
8 performs a decoding process using a processor with at least
9 memory and program code.

10 Q. And turning to the AV1 specification, how does an
11 AV1 decoder -- let me rephrase.

12 Does the AV1 specification dictate that an AV1
13 decoder would practice elements 8A and 10A?

14 A. So the AV1 specification also specifies a decoder
15 performing a decoding process requiring a processor with
16 memory and computer program code.

17 Q. Now, earlier today when we were talking about the
18 '818 patent, we looked at the processors in the accused
19 products. Is that correct?

20 A. That's correct.

21 Q. Does your analysis of processor as to that '818
22 patent apply equally to the '321 patent?

23 A. Yes, sir, it does.

24 Q. So do each of the accused products actually
25 include a processor?

1 A. Yes, sir, they all do.

2 Q. And do each of the accused products include at
3 least one memory, including computer program code?

4 A. Yes, sir, they all do.

5 Q. And does that program code cause the video
6 decoder to perform other elements of claim 10?

7 A. That's how it works, yes.

8 Q. Okay. Let's turn to slide 64 and touch on
9 elements 8B and 10B of the '321 patent. Do the accused
10 products practice elements 8B and 10B of the '321 patent?

11 A. Yes, they do.

12 Q. Focusing first on the H.264 standard, does the
13 H.264 standard require a decoder to decode an indication of
14 at least one image frame, which is the first image frame in
15 decoding order of an independent sequence, which is the part
16 in green of the claims?

17 A. Yes, it does.

18 Q. And can you explain your opinions?

19 A. Sure. The indication in H.264 is the
20 instantaneous decoding refresh IDR picture, it's what I have
21 highlighted in green, is the first picture of each coded
22 video sequence which is IDR picture. And that's represented
23 by a nal_unit 5.

24 Q. So the indication at least one image frame that
25 you're focused on is the nal_unit type 5, which indicates an

1 IDR picture?

2 A. That's correct.

3 Q. Okay. Now, in the H.264 standard, does it
4 require a decoder to perform the second half of elements 8B
5 and 10B where it requires all motion-compensated temporal
6 prediction references of the independent sequence to refer
7 only to image frames within that sequence?

8 A. Yes, sir, it does.

9 Q. And can you explain your opinion as to H.264 on
10 that element?

11 A. Absolutely. So in the same section highlighted
12 in yellow, it specifies that decoding of an IDR picture, all
13 following coded pictures in decoding order can be decoded
14 without interprediction from any picture decoded prior to
15 the IDR picture. So it is satisfying the second part of the
16 claim element.

17 Q. And, Dr. Kia, what is a nal_unit?

18 A. Nal_unit is a type of packet that H.264 uses. So
19 the slices are packetized. So it has its own packet type.
20 So this nal_unit 5, it's specifying that the packet that was
21 sent is of type 5.

22 Q. And I know you pointed to the IDR picture as the
23 first image of the video sequence, first image frame, but
24 can you just give a little more context to what an IDR
25 picture is?

1 A. An IDR picture is generally an I-frame. It can
2 build itself by the information wholly owned by itself. It
3 further provides information that it is a first picture of
4 an independent sequence.

5 Q. Okay. And the nal_unit type 5 is a specific
6 indication to tell a decoder which frame is an IDR picture,
7 correct?

8 A. That's correct.

9 Q. And the nal_unit type 5 also provides an
10 indication of which frame is the first frame of an
11 independent sequence, correct?

12 A. That's correct.

13 Q. Okay. Now, focusing on H.265, are your opinions
14 with respect to H.265 similar to H.264?

15 A. Yes, sir, they are.

16 Q. What is the indication of at least one image
17 frame, which is the first image frame in decoding order of
18 an independent sequence in H.265?

19 A. So in H.265, they are -- there's at least two
20 indications that can be used. One is the instantaneous
21 decoding refresh, IDR, picture, very similar to H.264, but
22 H.265 also has intra random access point IRAP picture. And
23 those have nal_units 19 and 20.

24 Q. So the nal_unit type 19 and 20 is an indication
25 you're pointing to to identify the IDR and IRAP pictures in

1 H.265?

2 A. That's correct.

3 Q. Okay. And does H.265 meet the element in yellow
4 about the motion-compensated temporal prediction references
5 referring only to image frames in that sequence?

6 A. That's correct. They highlight that the pictures
7 following these picture types do not refer to pictures
8 before it.

9 Q. And it's the part of the H.265 standard that
10 you've relied on highlighted in yellow on the screen?

11 A. Yes, sir, it is.

12 Q. Okay. Let's shift over to AV1. Does AV1 require
13 decoding an indication of at least one image frame, which is
14 the first image frame in decoding order of an independent
15 sequence?

16 A. Yes, sir, it is.

17 Q. What is the indication of at least one image
18 frame that you're pointing to?

19 A. The indication is a key frame, which is specified
20 by the parameter frame type of 0.

21 Q. And so the key frame of frame type 0 is what
22 you're pointing to as the indication of at least one image
23 frame, which is the first image frame of an independent
24 sequence?

25 A. That's correct.

1 Q. And what's your basis for saying the AV1
2 specification requires the final part of the claim that's
3 highlighted in yellow on this slide?

4 A. Well, what I've highlighted in yellow is that
5 when a key frame is encountered, is that the decoding
6 process -- it resets the decoding process. And what that
7 means is that when it resets, there's no other frames
8 present and the decoding can proceed from that frame.

9 I've also highlighted intra-frame and
10 intra-prediction, where it is specifying that the pictures
11 are built without any prior frames.

12 MR. FRIST: Your Honor, I believe now we have to
13 go back on the third-party confidential record.

14 JUDGE ELLIOT: Very well.

15 (Whereupon, the hearing proceeded in confidential
16 session.)

17

18

19

20

21

22

23

24

25

1 O P E N S E S S I O N

2 MR. KLEIN: May I proceed, Your Honor?

3 JUDGE ELLIOT: Yes.

4 MR. KLEIN: Thank you.

5 CROSS-EXAMINATION

6 BY MR. KLEIN:

7 Q. Good afternoon, Dr. Kia.

8 A. Good afternoon, sir.

9 Q. I want to talk to you about -- talk with you
10 about the '818 patent. During your direct you testified
11 about the priority date of the '818 patent, right?

12 A. I testified about the conception date, which is
13 the priority date, yes.

14 Q. And you testified that the claims of the '818
15 patent were conceived in late April or early May of 2002.
16 Is that about right?

17 A. Yeah, April 27th and May 1st of 2002.

18 Q. And you testified that the JVT-Cxxx and JVT-C078
19 and their annexes show conception in that time frame, right?

20 A. That's correct, yes.

21 Q. You also testified on direct that the two
22 documents are identical except there is a number for the
23 submission and they filled out some of the forms in one of
24 the documents, right?

25 A. That's correct.

Heritage Reporting Corporation
(202) 628-4888

1 Q. May we have JX-0475.

2 I want to see if we can agree on what is
3 disclosed in this document. Do you see the document name in
4 the upper right-hand corner, Dr. Kia?

5 A. Yes, sir, I do.

6 Q. Does that say JVT-C078?

7 A. That's correct.

8 Q. Is this one of the documents on which you rely
9 for conception?

10 A. Yes, sir, that is.

11 Q. For background, you testified on direct JVT-C078
12 tries to improve on the parameter set concept disclosed in
13 VCEG-N52, correct?

14 A. Can you repeat your question? I'm sorry.

15 Q. You testified during your direct that JVT-C078
16 tries to improve on the parameter set concept disclosed in
17 VCEG-N52, right?

18 A. Yes, sir, it is.

19 Q. You said on direct that VCEG-N52 proposed one
20 parameter set structure, right.

21 A. That's correct.

22 Q. And that one parameter set structure had sequence
23 parameters, picture parameters, slice parameters, and
24 independent GOP parameters, right?

25 A. That's correct. But the sequence parameters are

1 the independent GOP parameters.

2 Q. Yeah. We will get to that.

3 And in this document, instead of one parameter
4 set, JVT-C078 proposes four parameter set structures, right?

5 A. As an example.

6 Q. Does this document ever say that four parameter
7 set structures is an example?

8 A. This is a proposal to discuss their idea.

9 Q. Let's see what is actually in this document,
10 Dr. Kia.

11 A. Okay.

12 Q. Can we scroll down a little bit under the
13 summary? Yeah.

14 So it says "instead of one parameter set
15 structure, we propose four structures." Did I read that
16 correctly?

17 A. Yes, sir, you did.

18 Q. It says there is an independent GOP parameter
19 set, right?

20 A. Yes, sir, it does.

21 Q. A picture parameter set, right?

22 A. Yes.

23 Q. Slice parameter set?

24 A. That's correct.

25 Q. And a presentation parameter set, correct?

1 A. That's correct.

2 Q. It doesn't say instead of one parameter set
3 structure you propose at least two structures, does it?

4 A. This part, it does not, no.

5 Q. And if we look at the Figure 1 on page 3, we see
6 those four parameter sets proposed in this document,
7 correct?

8 A. Yes, that's what I showed also in my direct.

9 Q. And in this figure, an arrow indicates a
10 reference based on a parameter set identifier. We agree on
11 that, right?

12 A. Yes, that's right.

13 Q. So on the left, we have boxes with IDERP and SSP,
14 correct?

15 A. That's correct.

16 Q. And those generally refer to slice headers,
17 right?

18 A. Yes.

19 Q. So the slice headers have an identifier to a
20 slice parameter set, correct?

21 A. Well, in this example they do, yes.

22 Q. Well, sir, we just looked above where it says we
23 propose four parameter set structures, correct?

24 A. Yes. And this is an example -- describing their
25 example.

1 Q. But, again, this document doesn't say example
2 anywhere in terms of describing the number of parameter set
3 structures, right?

4 A. This document so far is trying to explain their
5 idea.

6 Q. Right. And your testimony is that this document
7 proposes four parameter set structures, but based on the
8 inventor's testimony, it's your understanding this was just
9 an example to them, right?

10 A. Well, there is also discussion about the coded
11 and conveyed that discusses only two parameter sets to be
12 coded and conveyed.

13 Q. Well, we will get to that example.

14 A. Okay.

15 Q. But your testimony is that the named inventors
16 believed this was just an example, right?

17 A. So through their testimony, their deposition,
18 they also said the same thing.

19 Q. And so the slice parameter set then refers to a
20 picture parameter set, right?

21 A. Yes, sir.

22 Q. And then the picture parameter set refers to both
23 an independent GOP parameter set and a presentation
24 parameter set, right?

25 A. That's what this figure shows, yes.

1 Q. And is your testimony that the proposal in this
2 document was adopted into the standard, right?

3 A. That is correct, yes.

4 Q. And it is your opinion that the proposal in this
5 document made it into the JVT reference code, right?

6 A. That's correct, yes.

7 Q. Just to be clear, you weren't part of the JVT at
8 this time, right?

9 A. I'm sorry, what was that?

10 Q. Just to be clear, you weren't part of the JVT at
11 this time?

12 A. That's right, I was not.

13 Q. You have never attended a JVT meeting, right?

14 A. No, I did not.

15 Q. But you agree with me that the JVT documents
16 provide a contemporaneous record of what the JVT members
17 were saying and doing around this time frame, right?

18 A. Well, the JVT documents serve the purpose of the
19 JVT standardization process. So this is how they propose
20 ideas, capture the meeting output, various other things.
21 This is part of their process.

22 Q. So is that a yes to my question, Dr. Kia, that
23 the JVT documents provide a contemporaneous record of what
24 was going on in the JVT?

25 A. Well, I mean, it does more than that. There is

1 at least provides a record of when things happen, what was
2 proposed.

3 Q. All right. Let's take a look at the documents
4 themselves. May we have RX-0511, please.

5 Can you see title draft report of Fairfax meeting
6 at the top?

7 A. Yes, sir, I do.

8 Q. And the authors are Gary Sullivan, Ajay Luthra,
9 and Thomas Wiegand, right?

10 A. That's correct.

11 Q. They are the chairs and co-chairs of the JVT,
12 right?

13 A. That's what it says.

14 Q. And they were at this meeting?

15 A. They are the authors of this document.

16 Q. But they were at the May meeting in Fairfax?

17 A. I believe they were, but I wasn't there so I
18 cannot first handedly confirm that.

19 Q. That's right. Because you weren't there, right?

20 A. That's correct.

21 Q. Okay. And on page 29 there is an entry that
22 starts with "JVT-C078." Do you see that?

23 A. I do see that.

24 Q. And the description says "proposed syntax and
25 semantics of parameter set update NAL packets (PUPs). Four

1 parameter set structures are used: Independent GOP,
2 picture, slice, and presentation parameter set."

3 Did I read that correctly?

4 A. You did read that correctly.

5 Q. And in this document, it doesn't say that these
6 two parameter set structures are used, right?

7 A. That's just a title of what that proposal was
8 doing. I'm not -- I cannot agree that that's what the
9 actual proposal is with that one sentence?

10 Q. So Dr. Kia, are you saying that that doesn't
11 reflect what the proposal was to the JVT?

12 A. I am saying that one sentence doesn't -- well,
13 the two sentences, doesn't capture it accurately.

14 Q. This doesn't accurately reflect the proposal?

15 A. Well, I mean, the proposal is a multi-page
16 document. How can two sentences capture that?

17 Q. Okay. So it's your testimony that Gary Sullivan
18 and the others who wrote this didn't actually capture what
19 was in the proposal, right?

20 A. Well, it's just a reference of what was proposed.
21 That's all.

22 Q. Okay. Let's see what else was disclosed. So
23 then the next paragraph says, "the group decided to have
24 only the independent GOP parameter set."

25 Did I read that right?

1 A. Yes, sir, you did.

2 Q. It says "some of the proposed parameters were
3 considered potentially unnecessary." Did I read that right?

4 A. Yes, sir, you did.

5 Q. The group, that is not just Dr. Hannuksela,
6 right?

7 A. That's right. That's the JVT team that all voted
8 together as a whole.

9 Q. The group isn't Dr. Hannuksela and Mr. Wang,
10 right?

11 A. That's right. It's the entirety of the JVT
12 group.

13 Q. And Dr. Hannuksela and Mr. Wang are named
14 inventors on the '818 patent, right?

15 A. Yes, sir, they are.

16 Q. And later on, someone noticed that a picture
17 parameter set might become handy at some point. Do you
18 recall that?

19 A. I do recall that.

20 Q. Do you recall who made -- who noticed that?

21 A. It is my recollection that Dr. Hannuksela stated
22 that in a minutes meeting for Nokia. I think in his
23 declaration, he said he does not know exactly who that was.

24 Q. Dr. Hannuksela testified that it wasn't him who
25 noticed that, right?

1 A. Well, it is hard to say because in this
2 presentation, the one previous to this that led to this
3 output, JVT-C078, I'm sure he discussed the parameter set
4 for picture parameter set. So someone at the audience might
5 have done it, but I'm sure he is a proponent for it.

6 Q. Dr. Kia, I have limited time so if you could
7 answer my questions yes or no when they are yes-or-no
8 questions. That would be great. If your counsel has, wants
9 to provide you room for more explanation, they will have
10 that opportunity.

11 Let's take a look at what Dr. Hannuksela said
12 during his deposition. Can we have RX-5289.

13 391, lines 14 to 17.

14 "Question: Who later noticed that a picture
15 parameter set might become handy at some point?

16 "Answer: Somebody else than me. I think
17 somebody else than me made that conclusion."

18 That's the testimony from Dr. Hannuksela, right?

19 A. That's correct.

20 Q. And you read Dr. Wang's depo when you were
21 preparing your report, correct?

22 A. That's correct.

23 Q. And Dr. Wang said he didn't even attend that
24 Fairfax meeting, right?

25 A. I do not recall --

1 Q. Okay.

2 A. -- that particular phrase.

3 Q. Well you recall Dr. Wang saying he didn't even
4 start attending JVT meetings until later in the year?

5 A. I do not recall what he said about that, no.

6 Q. Well, let's look at Dr. Wang's depo transcript.
7 May we have RX-5317.

8 Page 145, lines 10 to 13, please.

9 "Question: Got it. And you were not at that
10 fourth meeting July 22 to 26, 2002?

11 "Answer: I didn't attend that meeting. My first
12 meeting was JVT-E, the next meeting."

13 That's what Dr. -- or Mr. Wang said during his
14 deposition, right?

15 A. Okay.

16 Q. And H.264 specifies a sequence parameter set,
17 right?

18 A. That's correct.

19 Q. And it specifies a picture parameter set?

20 A. That's correct.

21 Q. And so H.264 specifies two parameter sets, right?

22 A. That's correct.

23 Q. Now, you testified on direct that Dr. Hannuksela
24 and Mr. Wang conceived of the two parameter sets that are in
25 the claims, right?

1 A. That's correct, yes.

2 Q. Let's take a look at what some of those
3 contemporaneous JVT documents show. May we have RX-3510.

4 This is an e-mail from Gary Sullivan at the top.
5 You see that?

6 A. Yes, I do.

7 Q. We have heard a lot about Mr. Sullivan today,
8 right?

9 A. Somewhat, yes.

10 Q. This e-mail is dated May 25th, 2002. Do you see
11 that?

12 A. I do see that.

13 Q. And Mr. Sullivan worked at Microsoft around this
14 time?

15 A. I do not know about that. I do not know Mr. or
16 Dr. Sullivan personally, like Dr. Orchard did.

17 Q. Okay. But he -- we saw earlier that he was the
18 chair of the JVT, right?

19 A. That's correct, yes.

20 Q. And Gary Sullivan sent this e-mail to the JVT
21 experts distribution list, right?

22 A. Yes. They are cc'd on it.

23 Q. And Mr. Sullivan said he thought the parameter
24 set concept is a good one, right?

25 A. That's correct.

1 Q. But he said there should be a distinction between
2 global sequence level parameter sets and lower-level dynamic
3 parameter sets.

4 Did I read that right?

5 A. That's correct.

6 Q. So Gary Sullivan is proposing two parameter sets,
7 a global sequence level parameter set and a lower-level
8 dynamic parameter set, right?

9 A. Well, in this e-mail, he's discussing that.

10 Q. So in this e-mail, he is discussing those two
11 parameter sets, right?

12 A. So both of those parameter sets that you are
13 talking about there are in plural. So I think what
14 Mr. Sullivan -- Dr. Sullivan is suggesting is that there
15 should be more than one level.

16 Q. A higher level and a lower level, right?

17 A. I think that's what I get out of that section,
18 yes.

19 Q. Mr. Sullivan also proposes placing frame_num in
20 the slice header. Do you see that in about the third
21 paragraph, third line down, and frame_num should be moved
22 into the slice header; do you see that?

23 A. I do see that.

24 Q. The third line down, starts with "I."

25 Sorry, you see that Dr. Kia, right?

1 A. That part in the e-mail, yes, I do see that.
2 That's what he is saying.

3 Q. And you point to frame_num in the slice header to
4 show infringement by the accused products, right?

5 A. That's correct.

6 Q. Gary Sullivan wasn't the only person at the JVT
7 working on parameter sets, right?

8 A. Can you repeat your question again?

9 Q. Gary Sullivan wasn't the only person at the JVT
10 at this time working on parameter sets, right?

11 A. Well, I'm not sure if Gary Sullivan was working
12 on the parameter set. This is an e-mail reflecting what his
13 ideas are.

14 Q. Let's take a look at --

15 A. What his thoughts are. I'm sorry.

16 Q. Okay. He is projecting his thoughts. Let's look
17 at what some of the other documents say.

18 May we have RX-0091.

19 This is a proposal from Toby Walker and Ali
20 Tabatabai; do you see that?

21 A. I do see that.

22 Q. They are at Sony Corporation, right?

23 A. That's correct.

24 Q. Under the summary, if we look at the second
25 bullet point, there is a heading labeled parameter sets. Do

1 you see that?

2 A. I do see that.

3 Q. And they say the parameters are split into
4 sequence parameter set (i.e. static parameters) and slice
5 parameter set (i.e. dynamic parameters)."

6 Do you see that?

7 A. I do see that.

8 Q. So they propose splitting the parameter set into
9 two parameter sets, a sequence parameter set and a slice
10 parameter set, right?

11 A. They are proposing that later than the conception
12 documents that I showed earlier.

13 Q. We will get to that, but please answer my
14 question. They are proposing two parameter sets, right?

15 A. For this proposal of theirs, yes, that's what
16 they are doing.

17 Q. Okay. And one document you didn't show on your
18 direct was that Nokia had a later submission to the JVT
19 about parameter sets, right?

20 A. Refresh my memory. I think I know what you're
21 talking about, but --

22 Q. Let's go back to the documents. May we have
23 RX-0037, please.

24 Do you see the title is "Modifications to
25 High-Level Syntax and Semantics," right?

1 A. Yes, sir.

2 Q. The author is, there is Miska Hannuksela,
3 correct?

4 A. That's correct.

5 Q. And Ye-Kui Wang is there, right?

6 A. Yes, sir.

7 Q. There is a third Young-Kwon Lim; do you see that?

8 A. I do see that.

9 Q. And, again, Dr. Hannuksela and Mr. Wang wrote
10 that JVT-C078 that we looked at earlier, right?

11 A. That's correct.

12 Q. And this document was submitted ahead of the July
13 meeting in Austria, right?

14 A. That's correct, yes.

15 Q. If we go to page 2, look at about the fourth
16 paragraph, we see it says, "We propose that infrequently
17 changing parameters are collected into the parameter set
18 similarly to the JVT CD. The referred parameter set and its
19 values must be remain the same within one independent GOP."
20 Do you see that?

21 A. I do see that.

22 Q. So that's one parameter set, right?

23 A. That is one sequence parameter set.

24 Q. Okay. And then the next paragraph says
25 "parameters that are allowed to change on picture basis but

1 which remain the same throughout all slices of a picture are
2 generally collected into the picture parameter set
3 structure."

4 Do you see that?

5 A. I do see that.

6 Q. So that's a second parameter set structure,
7 right?

8 A. Yes.

9 Q. If we scroll down to page 4, in the second bullet
10 point it says, "The slice header as proposed in this
11 document contains an identifier of both the parameter set
12 and the picture parameter set."

13 Did I read that right?

14 A. Yes, you did.

15 Q. Okay. Then it goes on to say, "It is possible to
16 get rid of the other identifier by nesting the identifiers
17 as proposed in JVT-C078."

18 Do you see that?

19 A. I do see that.

20 Q. And JVT-C078 was the document we looked at
21 earlier, right?

22 A. That's correct.

23 Q. Okay. It says "However, the bit-rate saving was
24 considered as negligible." Do you see that?

25 A. I do see that.

1 Q. If we scroll down to page 7, do you see the slice
2 header there, right?

3 A. Yes. This is the slice header. It's still part
4 of the proposal.

5 Q. And the slice header contains a parameter_set_ID
6 variable; do you see that?

7 A. I do see that.

8 Q. And it contains a picture_parameter_set_ID
9 variable; do you see that?

10 A. I do see that, yes.

11 Q. So this slice header has an identifier to two
12 different parameter sets, right?

13 A. Yeah, that's the one you just highlighted a
14 minute ago.

15 Q. Okay. And you understand that Mr. Wang has
16 testified that when you change the number of parameter sets,
17 you can change the design criteria of the structure.

18 Do you recall that?

19 A. You have to go a little bit slowly on that for
20 me. Can you repeat it?

21 Q. Do you recall that Mr. Wang, one of the named
22 inventors, testified that having a different number of
23 parameter sets can affect the design criteria of which
24 parameters go where?

25 A. That's correct, yes.

1 Q. So do you remember his testimony on that, right?

2 A. Generally, yes.

3 Q. Okay. Now, I want to transition a little bit to
4 the reference code. Again, you testified on direct that
5 JVT-D145 was integrated into the reference code, right?

6 A. That's correct, yes.

7 Q. And you heard Mr. Suehring testifying that
8 Dr. Hannuksela was originally tasked with implementing
9 JVT-D145 into the reference code, right?

10 A. That's what he said, yes.

11 Q. Okay. And you recall that after he was
12 originally tasked with making that implementation,
13 Dr. Hannuksela e-mailed the JVT about implementing JVT-D145.

14 Do you recall that?

15 A. Well, if you're referring to the e-mail that you
16 showed Mr. Suehring, yes, I do remember that.

17 Q. Okay. Let's bring it up so we can see it. May
18 we have RX-3524, please.

19 This is the e-mail you saw during Mr. Suehring's
20 testimony, right?

21 A. That's correct.

22 Q. And I want to highlight some excerpts that we
23 didn't necessarily cover with Mr. Suehring. And in the
24 beginning, Dr. Hannuksela says he was assigned -- do you see
25 that -- "I have marked as the implementer or I have been

1 marked as the implementer of high-level syntax, JVT-D145,
2 obviously because I acted as the chair of the breakout group
3 that produced the document."

4 Do you see that?

5 A. I do see that, yes.

6 Q. He then goes on to say "Unfortunately, I lack the
7 time, the skills, and the knowledge of how to implement
8 JVT-D145 into the software." Do you see that?

9 A. I do see that.

10 Q. Okay. And this is an e-mail in Dr. Hannuksela's
11 own words, right?

12 A. Well, Dr. Hannuksela wrote this, simple.

13 Q. Agreed. So let's look at another document. May
14 we have RX-5501.

15 And you heard Mr. Suehring talk about this
16 document as well, right?

17 A. Yes, I remember this was asked, yes.

18 Q. And in this e-mail Mr. Wang says that he, Dong
19 Tian and Miska Hannuksela would like to implement our
20 "stuffs," right?

21 A. I remember the conversation, yes.

22 Q. And JVT-D145 is not listed in this e-mail, right?

23 A. That's correct.

24 Q. And JVT-C078 isn't listed in this e-mail, is it,
25 right?

1 A. C078 would be the proposal. It would be here.
2 It would be the output of the meetings that would do it but
3 it is not here, no.

4 Q. Dr. Kia, do you see JVT-C078 listed in this
5 e-mail?

6 A. No, I do not.

7 Q. Now, Dr. Kia, I am going to pass you to my
8 colleague, Ms. Brewer, who is going to ask you some
9 questions about the '321 patent.

10 A. Okay.

11 MS. BREWER: Good afternoon, Your Honor. I am
12 Robin Brewer, counsel for Amazon. I will be crossing
13 Dr. Kia on behalf of Respondents as it relates to the '321
14 patent and domestic industry.

15 CROSS-EXAMINATION

16 BY MS. BREWER:

17 Q. Good afternoon, Dr. Kia.

18 A. Good afternoon.

19 MS. BREWER: So I'm going to start with domestic
20 industry. I will need to go on to the confidential record,
21 the third-party confidential record.

22 JUDGE ELLIOT: Okay.

23 (Whereupon, the hearing proceeded in confidential
24 session.)

25

1 O P E N S E S S I O N

2 BY MS. BREWER:

3 Q. If we could pull up the asserted claims of the
4 '321 patent, so claims 8 and 10.

5 Dr. Kia, if you could just confirm that these are
6 the asserted claims for the '321 patent?

7 A. It looks like to be them, yes.

8 Q. Great. Claim 8 is a method. So it lists out
9 steps, right?

10 A. That's correct.

11 Q. And claim 10 is an apparatus claim, so it's a
12 device; is that right?

13 A. That's correct. It is an apparatus claim.

14 Q. It's an apparatus claim. But that device in
15 claim 10 is configured to perform certain steps. Is that
16 correct?

17 A. Yes, it is.

18 Q. And you would agree with me that the steps are
19 basically the same between the two claims, right?

20 A. That's correct, yes.

21 Q. So I'm going to focus on claim 10, the apparatus
22 claim. And I have a couple of questions related to what you
23 have identified as limitation 10A, which is the preamble
24 there.

25 A. Yes, okay.

1 Q. If we go to slide 63, so CDX-5C.63, you testified
2 that any H.264 decoder would necessarily have to have the
3 processor memory and computer code of claim element 10A to
4 decode H.264 compliant video; is that right?

5 A. That's correct.

6 Q. Okay. And you understand that there are
7 thousands of products at issue in this case, right?

8 A. I don't have first knowledge of that. I know
9 there's a lot of products. I don't know the number.

10 Q. Right. There's a lot of products between HP and
11 Amazon. There's a lot of products at issue, right?

12 A. I understand that, yes.

13 Q. You testified that all of those products have a
14 processor. Is that right?

15 A. That's correct, through the interrogatories that
16 I showed.

17 Q. And that testimony was in response to a single
18 question without analysis of any of the technical
19 specifications of those components. Is that right?

20 A. I'm sorry, I lost you.

21 Q. Yeah. So when you responded to that question,
22 you didn't dive into the technical specifications of the
23 processors, did you?

24 A. When I answered what question?

25 Q. When you answered the question saying that all of

1 the accused products have a processor, you did not dive into
2 the technical specifications of those processors, did you?

3 A. No, I just identified the processor, is that
4 there are processors in every one of those devices.

5 Q. Right. So these are just the generic processors
6 that come in most computers; is that right?

7 A. Well, they are processors. They are not memory.
8 They are not disk drives. They are not matter. They are
9 processors.

10 Q. Right. And they are not specialized in any way
11 or unique?

12 A. I mean, they could be, but at least they are
13 processors.

14 Q. Okay. So just generic processors would meet this
15 claim limitation?

16 A. So I remember what I highlighted was both CPUs
17 and GPUs. So the "P" in both of them are processors. So I
18 just identified that all of the devices, the HP and Amazon
19 devices have a processor, either CPU or GPU or both.

20 Q. Right. I am just trying to confirm the scope of
21 processors that would meet this limitation. So it could be
22 any generic processor can meet this limitation, right?

23 A. Well, the processor that -- so the processor
24 would need to do all of the steps that are required in the
25 claim.

1 Q. Right. But besides performing the claimed steps,
2 there are no special technical requirements of the
3 processor, right?

4 A. Well, other than the required elements in the
5 claim, the processors are just the processor.

6 Q. Right. So let's see if I can't get a clean
7 answer there. So besides performing the claimed steps,
8 there are no special technical requirements of the
9 processor; is that right?

10 A. Well, again, I have to go back to my previous
11 answer that it's a processor that needs to meet the other
12 limitations of the claim.

13 Q. Okay. But besides that, there is nothing special
14 about this processor?

15 A. Beyond that? I mean, the processor needs to have
16 the power to be able to do something, so, I mean, I can
17 think of a processor I use before that cannot possibly
18 decode a video. So it's -- I'm just -- I just identified
19 the processor that are in the products.

20 Q. Okay. And when you testified that the accused
21 products, the processor in the accused products met this
22 limitation, you didn't opine as to what their power was; is
23 that right?

24 A. That's correct, I did not.

25 Q. And so none of your allegations relate to a

1 specialized processor; is that right?

2 A. My allegations -- well, my evidence relies on the
3 specific processors that were identified to be used in the
4 -- that are used in their products.

5 Q. Right. And you offered an opinion where you
6 grouped all of the processors in the accused products
7 together, right? You just said there are processors in the
8 accused products that meets this limitation?

9 A. Well, no. I don't think I grouped them into one.
10 I said that every product has a processor. I mean, I don't
11 know where you get the grouping from.

12 Q. Right. And you weren't asked a single question
13 as to whether or not all of the accused products had a
14 processor, and you said yes, they do; is that right?

15 A. That's right. So if the group is if all of the
16 products has a processor in it, yes, that group, I said
17 that.

18 Q. Right. All right.

19 And also you testified that they all have -- all
20 the accused products have memory and computer code, right?

21 A. That's correct.

22 Q. And, again, you didn't get into any of the
23 technical specifications of the memory?

24 JUDGE ELLIOT: Can I jump in here? Is there a
25 dispute about this?

1 MS. BREWER: Yes.

2 JUDGE ELLIOT: What is the dispute? Are you
3 saying that the accused products don't have a processor or
4 don't have memory?

5 MS. BREWER: No.

6 JUDGE ELLIOT: What is the dispute?

7 MS. BREWER: No, Your Honor. I'll move on. I
8 just wanted to confirm that there is nothing --

9 JUDGE ELLIOT: I mean, you have been spinning
10 your wheels for the last five minutes.

11 MS. BREWER: I understand, Your Honor.

12 JUDGE ELLIOT: Go ahead.

13 MS. BREWER: I just wanted to confirm there was
14 no specialized memory, but it seems like we're all in --

15 JUDGE ELLIOT: The processor is required to have
16 certain features and through its code and its memory and
17 that's in the rest of the claim. So move on to something
18 else, please.

19 MS. BREWER: Okay.

20 BY MS. BREWER:

21 Q. So I want to talk about the requirement in the
22 claims related to the first frame of an independent
23 sequence.

24 A. Okay.

25 Q. Let's see. So for H.264, you have identified an

1 IDR picture as the first picture of an independent sequence,
2 correct?

3 A. Are we showing that on the display?

4 Q. Sorry? No, no, we can take this down if it is
5 distracting.

6 A. Yeah.

7 Q. Okay. So, again, I want to just talk about the
8 first frame of an independent sequence, focusing on that.

9 A. Okay.

10 Q. For H.264 you have identified an IDR picture as
11 the first picture of an independent sequence, correct?

12 A. That's correct.

13 Q. And in H.264, that IDR picture is followed by 0
14 or more non-IDR pictures, including all subsequent pictures
15 up to but not including any subsequent IDR pictures.

16 Is that right?

17 A. That's one part of the requirement of an IDR
18 picture, yes.

19 Q. So in H.264, an IDR picture is the start of an
20 independent sequence that continues until the next IDR
21 picture, right?

22 A. That's correct, yes.

23 MS. BREWER: And I now need to go on to the
24 third-party confidential record.

25 (Whereupon, the hearing proceeded in confidential

1 session.)

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 BY MS. BREWER:

3 Q. So if we stay with Fire OS, did you confirm that
4 products with Fire OS actually support AV1?

5 Dr. Kia, you confirmed that the products with
6 Fire OS actually support AV1.

7 A. That's what I have on my charts, yes.

8 Q. Okay. And you said that the Fire Tablets with
9 Fire OS have AV1 and infringe the '321 patent?

10 A. I believe so, yes.

11 Q. Okay. So let's take a look. If we can pull up
12 CX-1034. This is a product detail page for the Fire Max 11.
13 Do you see that?

14 A. Okay.

15 Q. And you relied on this sort of document for your
16 analysis, right? If we could scroll down a little bit so we
17 can see a little bit of the document.

18 A. Maybe you can -- there we go. Yes. Generally,
19 yes. I mean, based on some of the information that's on
20 there.

21 Q. Okay. Let's take a look at page 3.

22 Do you see for AV1 it says supported?

23 A. Yes, I do.

24 Q. Okay. So when an Amazon product supports AV1,
25 that information is included here, right?

1 A. It is included in this one.

2 Q. Okay. Let's take a look at another one. If we
3 can pull up CX-1028.

4 This is a product detail page for the Fire 7
5 tablet; is that right, 12th gen?

6 A. It looks like it, yes.

7 Q. And if we look at page 3 again under video
8 Codecs, do you see with AV1 with film grain, it has an N/A?

9 A. Yes, I do see that.

10 Q. This document does not say that AV1 is supported,
11 right?

12 A. It says it is not applicable.

13 Q. Let's take a look at another one. If we can pull
14 up CX-1031. This is a product detail page for the Fire HD
15 10 tablet, 13th gen. Is that right?

16 A. Yes, it looks like it.

17 Q. If we look at page 3 under video Codecs, do you
18 see that for AV1 with film grain it says that AV1 is not
19 supported?

20 A. Yes, I do see that.

21 Q. Let's turn to slide 76 of your demonstratives, so
22 CDX-5C.76.

23 If you look at element 8E and 10E, the claims
24 require resetting the identifier value, right?

25 A. That's correct.

1 Q. And you have opined that any H.264 decoder is
2 required to reset the value of frame_num in order to decode
3 H.264 video, right?

4 A. I said frame_num or picture order count.

5 Q. And that's because H.264 says that if the current
6 picture is an IDR picture, frame_num shall be equal to zero.
7 Is that right?

8 A. Yes. And also the other highlight, the second
9 one after that.

10 Q. Okay. But I am focused on frame_num. Just focus
11 on frame_num. You have said that frame_num -- that the
12 H.264 decoder is required to reset the value of frame_num in
13 order to decode an H.264 video, right?

14 A. Or picture order count, one or the other. It
15 doesn't have to be just one.

16 Q. Okay. But related to frame_num, it resets the
17 frame_num because of this part of the H.264 specification
18 that says if the current picture is an IDR picture,
19 frame_num shall be equal to zero, right?

20 A. Well, this particular one says if the current
21 picture is an IDR picture, frame_num shall be equal to zero.

22 Q. Right. And that's from the specification?

23 A. That's from the specification. For the decoding
24 to proceed, for the IDR picture, the frame_num has to be
25 zero.

1 Q. And so that's required by H.264?

2 A. That's correct.

3 Q. Okay. Apologies, one last time I have to go back
4 on the confidential record. This is third-party
5 confidential.

6 JUDGE ELLIOT: Very well. Ms. Brewer, how
7 much --

8 MS. BREWER: I don't have much left, Your Honor.

9 JUDGE ELLIOT: Very well.

10 (Whereupon, the hearing proceeded in confidential
11 session.)

12

13

14

15

16

17

18

19

20

21

22

23

24

25

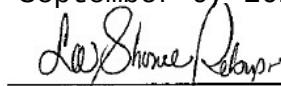
1	C O N T E N T S					
2						
3	WITNESS	DIRECT	CROSS	REDIRECT	RECROSS	STAFF
4	MICHAEL	15	72	100	104	
5	ORCHARD			106		
6	KARSTEN	107	128	139		
7	SUEHRING					
8	OMID KIA	142	249	314		
9			269			
10						
11	AFTERNOON SESSION: 161					
12						
13	CONFIDENTIAL SESSIONS					
14		48 - 57				
15		70 - 71				
16		177 - 200				
17		217 - 248				
18		270 - 277				
19		286 - 303				
20		308 - end				
21						
22						
23						
24						
25						

1 CERTIFICATE OF REPORTER
2 TITLE: Certain Video Capable Electronic Devices
3 INVESTIGATION NO: 337-TA-1380
4 HEARING DATE: September 9, 2024
5 LOCATION: Courtroom A
6 NATURE OF HEARING: Evidentiary Hearing

7 I hereby certify that the foregoing/attached
8 transcript is a true, correct and complete record of the
9 above-referenced proceedings of the U.S. International
Trade Commission.

9 Date: September 9, 2024

10 SIGNED:



11 Signature of the Contractor of the
12 Authorized Contractor's Representative
12 1220 L Street, N.W., Suite 206
13 Washington, D.C. 20005

13 I hereby certify that I am not the Court Reporter
14 and that I have proofread the above-referenced transcript
15 of the proceedings of the U.S. International Trade
16 Commission, against the aforementioned Court Reporter's
17 notes and recordings, for accuracy in transcription in the
18 spelling, hyphenation, punctuation and speaker
identification and did not make any changes of a
substantive nature. The foregoing/attached transcript is a
true, correct and complete transcription of the
proceedings.

19 SIGNED:



20 Signature of Proofreader

20 I hereby certify that I reported the above-referenced
21 proceedings of the U.S. International Trade Commission and
22 caused to be prepared from my tapes and notes of the
23 proceedings a true, correct and complete verbatim recording
of the proceedings.

23 SIGNED:



24 Signature of the Court Reporter

25

Heritage Reporting Corporation
(202) 628-4888

UNITED STATES INTERNATIONAL TRADE COMMISSION

In the Matter of:	)	Investigation No.
CERTAIN VIDEO CAPABLE ELECTRONIC	)	337-TA-1380
DEVICES, INCLUDING COMPUTERS,	)	
STREAMING DEVICES, TELEVISIONS,	)	
AND COMPONENTS AND	)	
MODULES THEREOF	)	

OPEN SESSIONS

Pages: 322 through 1019 (with excerpts)
Place: Washington, D.C.
Date: September 10, 2024

HERITAGE REPORTING CORPORATION

Official Reporters
1220 L Street, N.W., Suite 206
Washington, D.C. 20005
(202) 628-4888
contracts@hrccourtreporters.com

1 UNITED STATES INTERNATIONAL TRADE COMMISSION
2 Washington, D.C.
3 BEFORE THE HONORABLE CAMERON R. ELLIOT
4 Administrative Law Judge

5 _____
6 In the Matter of:) Investigation No.
7 CERTAIN VIDEO CAPABLE ELECTRONIC) 337-TA-1380
8 DEVICES, INCLUDING COMPUTERS,)
9 STREAMING DEVICES, TELEVISIONS,)
10 AND COMPONENTS AND)
11 MODULES THEREOF)
12 _____

13
14 International Trade Commission
15 500 E Street, S.W.
16 Washington, D.C.

17
18 Tuesday, September 10, 2024

19
20 EVIDENTIARY HEARING - VOLUME II

21
22 The Hearing commenced in Courtroom A, pursuant to the
23 notice of the Judge, at 9:00 a.m. Eastern.

24
25 Reported by: Karen Brynteson, FAPR, RMR, CRR

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES:

2

3 For Complainants Nokia Technologies Oy and Nokia
4 Corporation:

5 ADAM D. SWAIN, ESQ.

6 Alston & Bird LLP

7 950 F Street, N.W.

8 Washington, D.C. 20004

9

10 JOHN D. HAYNES, ESQ.

11 NICHOLAS T. TSUI, ESQ.

12 MARK A. McCARTY, ESQ.

13 DAVID S. FRIST, ESQ.

14 Alston & Bird LLP

15 1201 West Peachtree Street

16 Atlanta, GA 30309

17

18 THEODORE STEVENSON, ESQ.

19 Alston & Bird LLP

20 2200 Ross Avenue, Suite 2300

21 Dallas, TX 75201

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 For Complainants Nokia Technologies Oy and Nokia
3 Corporation:

4 JENNIFER D. CIELUCH, ESQ.

5 Alston & Bird LLP

6 90 Park Avenue

7 New York, New York 10016

8

9 WARREN LIPSCHITZ, ESQ.

10 SAM MOORE, ESQ.

11 ERIK B. FOUNTAIN, ESQ.

12 McKool Smith PC

13 300 Crescent Court, Suite 1200

14 Dallas, TX 75201

15

16 R. MITCH VERBONCOEUR, ESQ.

17 JOSHUA J. NEWCOMER, ESQ.

18 McKool Smith PC

19 303 Colorado Street, Suite 2100

20 Austin, TX 78701

21

22 LAUREN SIMENAUER, ESQ.

23 McKool Smith

24 1999 K Street, N.W., Suite 600

25 Washington, DC 20006

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent Amazon.com, Inc. and
3 Amazon.com Services LLC:

4 THOMAS N. MILLIKAN, ESQ.

5 KYLE CANAVERA, ESQ.

6 Perkins Coie LLP

7 11452 El Camino Real, Suite 300

8 San Diego, CA 92130

9

10 VERONICA S. ASCARRUNZ, ESQ.

11 EMILY RICH, ESQ.

12 Perkins Coie LLP

13 700 13th Street, N.W., Suite 800

14 Washington, D.C. 20005

15

16 STEFANI E. SHANBERG, ESQ.

17 ROBIN L. BREWER, ESQ.

18 KARL JOHNSTON, ESQ.

19 Perkins Coie LLP

20 505 Howard Street, Suite 1000

21 San Francisco, CA 94105

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent Amazon.com, Inc. and
3 Amazon.com Services LLC:

4 ANDREW KLEIN, ESQ.

5 Perkins Coie LLP

6 3150 Porter Drive

7 Palo Alto, CA 94304

8

9

10 MARTIN R. BADER, ESQ.

11 RYAN CUNNINGHAM, ESQ.

12 Sheppard, Mullin, Richter & Hampton LLP

13 12275 El Camino Real, Suite 100

14 San Diego, CA 92130

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 STEPHANIE L. ROBERTS, ESQ.

4 Morgan, Lewis & Bockius, LLP

5 1111 Pennsylvania Avenue, N.W.

6 Washington, D.C. 20004

7

8 JASON E. GETTLEMAN, ESQ.

9 COREY R. HOUMAND, ESQ.

10 Morgan, Lewis & Bockius, LLP

11 1400 Page Mill Road

12 Palo Alto, CA 94304

13

14 DAVID J. LEVY, ESQ.

15 RICK L. RAMBO, ESQ.

16 THOMAS R. DAVIS, ESQ.

17 Morgan, Lewis & Bockius, LLP

18 1000 Louisiana Street, Suite 4000

19 Houston, TX 77002

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 BRENT A. HAWKINS, ESQ.

4 Morgan, Lewis & Bockus, LLP

5 One Market Spear Street Tower, 28th Floor

6 San Francisco, CA 94015

7

8 ZACHARY D. MILLER, ESQ.

9 Morgan, Lewis & Bockus, LLP

10 110 North Wacker Drive

11 Chicago, IL 60606

12

13 MATTHEW J. RIZZOLO, ESQ.

14 RYAN BRUNNER, ESQ.

15 Ropes & Gray LLP

16 2099 Pennsylvania Avenue, N.W.

17 Washington, D.C. 20006

18

19 KEVIN J. POST, ESQ.

20 LANCE W. SHAPIRO, ESQ.

21 Ropes & Gray LLP

22 1211 Avenue of the Americas

23 New York, New York 10036

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 SHONG YIN, ESQ.

4 Ropes & Gray LLP

5 1900 University Avenue, 6th Floor

6 East Palo Alto, CA 94303

7

8 For the Office of Unfair Import Investigations:

9 MARISSA DUCCA, ESQ.

10 JEFFREY HSU, ESQ.

11 U.S. International Trade Commission

12 500 E Street, S.W.

13 Washington, D.C. 20436

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 P R O C E E D I N G S

2 (9:00 a.m.)

3 JUDGE ELLIOT: Good morning. Have a seat,
4 please.

5 All right. We're here in the matter of Certain
6 Video Capable Electronic Devices, Including Computers,
7 Streaming Devices, Televisions, and Components and Modules
8 Thereof, United States International Trade Commission,
9 Investigation No. 337-TA-1380.

10 My name is Cameron Elliot, Presiding
11 Administrative Law Judge. May I have appearances from
12 counsel, please.

13 MR. SWAIN: Good morning, Your Honor. Adam
14 Swain, again, from Alston & Bird. We have the same crew
15 here from yesterday, that we will have here for the entire
16 hearing. And we're ready to call our next witness once --

17 JUDGE ELLIOT: Very well. Good morning.

18 MR. HAWKINS: Brent Hawkins on behalf of HP.

19 JUDGE ELLIOT: I'm sorry. Say that again?

20 MR. HAWKINS: I'm sorry. Brent Hawkins on behalf
21 of HP.

22 JUDGE ELLIOT: Good morning.

23 MR. HAWKINS: Good morning, Your Honor.

24 MS. DUCCA: Marissa Ducca on behalf of OUII,
25 still with David Lloyd.

Heritage Reporting Corporation
(202) 628-4888

1 JUDGE ELLIOT: Good morning. All right. Yes.

2 MS. ASCARRUNZ: Just one more. Veronica

3 Ascarrunz on behalf of Amazon. And we also have the same
4 team here this morning.

5 JUDGE ELLIOT: Good morning. All right.

6 So anything that we need to deal with before we
7 start with the next witness?

8 MR. SWAIN: Nothing for Complainants, Your Honor.

9 MR. HAWKINS: Nothing for Respondents, Your
10 Honor.

11 MR. CANAVERA: Your Honor, we do have some
12 objections to some demonstratives. Kyle Canavera on behalf
13 of the --

14 JUDGE ELLIOT: Oh, very well. Okay. Come on up,
15 please.

16 MR. CANAVERA: Your Honor, they're for a witness
17 presented later in the day. Would you like to hear them now
18 or later?

19 JUDGE ELLIOT: Well, why don't you show them to
20 me now. If it looks like it's too much at the moment, then
21 I'll defer it until later, but let me see it now, please.

22 MR. SWAIN: Your Honor, pardon me, and I
23 apologize to Mr. Pitts and Your Honor. Our understanding
24 with the other side is we were going to take this up before
25 the witness took the stand, the appropriate witness, and I'm

1 not certain the crew to handle the demonstratives, to handle
2 this argument are here this morning, as a result of that
3 agreement.

4 JUDGE ELLIOT: Well, in that case, then let's do
5 it right before the witness testifies. Which witness is it,
6 by the way?

7 MR. CANAVERA: It's Dr. Moulin.

8 JUDGE ELLIOT: Very well.

9 MR. CANAVERA: Thank you, Your Honor.

10 JUDGE ELLIOT: We'll do that later.

11 MR. SWAIN: Thank you, Your Honor.

12 JUDGE ELLIOT: Okay. Call your next witness,
13 please.

14 MR. SWAIN: Thank you, Your Honor. Next,
15 Complainants call Dr. Keith Botner. And presenting
16 Dr. Keith Botner is our NEXT advocate, Ms. Lauren Simenauer.
17 Whereupon--

18 KEITH BOTNER,
19 having been first duly sworn/affirmed, was examined and
20 testified as follows:

21 THE WITNESS: Yes, I do.

22 JUDGE ELLIOT: Have a seat.

23 THE WITNESS: Thank you.

24 MS. SIMENAUER: Good morning, Your Honor. Lauren
25 Simenauer for Nokia.

1 DIRECT EXAMINATION

2 BY MS. SIMENAUER:

3 Q. Good morning, Dr. Botner. Would you please
4 introduce yourself to the Court.

5 A. Yes. Good morning --

6 THE REPORTER: I'm sorry, could you turn your
7 microphone on, please?

8 JUDGE ELLIOT: It should green. There should be
9 a green -- yeah.

10 THE WITNESS: Thank you. Good morning, everyone.
11 Good morning, Your Honor. I'm Dr. Keith A. Botner.

12 BY MS. SIMENAUER:

13 Q. And why are you here to testify today,
14 Dr. Botner?

15 A. So I'm here today to talk about a survey that
16 measures how consumers use certain Amazon and HP products,
17 as well as certain domestic industry products, in ways that
18 I understand are relevant to the H.265 standard.

19 Q. And have you prepared slides to show us today?

20 A. Yes, I have. And they're listed here as CDX-9.

21 Q. Great. So among other things, Respondents are
22 arguing that consumers don't actually use their products in
23 a way that infringes Nokia's patents. Just at a very high
24 level, can you briefly summarize what your survey evidence
25 tells us about that?

Heritage Reporting Corporation
(202) 628-4888

1 A. Yes, absolutely. In keeping it at a very high
2 level, in my survey I find that a meaningful number of
3 consumers are using certain accused products, as well as
4 domestic industry products, in ways that I find are relevant
5 to the patents at issue in this matter.

6 Q. And before we dive into the details, why are you
7 qualified to offer your opinion?

8 A. I'm qualified to offer my opinion as an expert in
9 surveys, marketing, and consumer behavior. In my current
10 role as a vice president at MMR Strategy Group, I serve as a
11 survey expert, and I also consult on marketing and
12 litigation surveys. I have over 25 years of experience in
13 marketing, as both a marketing practitioner in the corporate
14 space, as well as in academia, each of those focusing on
15 marketing and consumer behavior.

16 MS. SIMENAUER: Your Honor, Nokia tenders
17 Dr. Botner as an expert in surveys.

18 JUDGE ELLIOT: Very well.

19 BY MS. SIMENAUER:

20 Q. So today we're going to talk about two surveys.
21 Let's talk about the first one. What does it measure?

22 A. So as alluded to earlier, the survey measures how
23 consumers use certain accused products from HP and Amazon,
24 as well as certain domestic industry products, in ways that
25 I understand are relevant to the at-issue patents. And to

1 be clear, my survey did not set out to measure all possible
2 uses that may occur in the marketplace. Rather, my survey
3 measured select behaviors with specific products that I
4 understand are relevant.

5 Q. And how did you conduct your survey?

6 A. The survey was conducted online, which I would
7 say is the most typical for surveys in both litigation and
8 non-litigation contexts.

9 Q. How did you design your survey to test the uses
10 of the HP and Amazon devices that you just mentioned?

11 A. So I designed my survey in accordance with best
12 practices as established by survey authorities. And as seen
13 here on CDX-9.4, that incorporates numerous quality control
14 measures, which are listed on the left.

15 Allow me to focus on the visual appearing on the
16 right. So, for example, prospective survey takers are
17 brought into the survey. They're validated on such
18 variables as age and gender, such that it matches
19 information that's on record. Most importantly in this
20 matter, the survey qualifies respondents on use of relevant
21 products.

22 Furthermore, there are numerous other quality
23 control measures and data analysis-related safeguards. And
24 that resulted in 1,436 interviews that measured consumer use
25 of certain accused products.

1 Q. 1,436 interviews. Is that a large enough sample
2 size?

3 A. Yes. I feel that that is most sufficient in
4 aggregate. I also feel it's sufficient in the individual
5 product groupings that I test in my survey.

6 Q. And what makes you confident in your conclusions?

7 A. There are several reasons. First and foremost,
8 as noted on CDX-9.5, I designed what I would call a rather
9 conservative survey. So, for example, participants in the
10 survey were only asked about a subset of the accused
11 products.

12 Furthermore, participants were asked only about
13 one accused device, and that is irrespective of the number
14 of devices that they may have used. Furthermore, the survey
15 measures only a subset of all relevant usage in the
16 marketplace. And I also wanted to note that each focal
17 measure in my survey includes what's called a control
18 response that is subtracted from the focal measure.

19 Q. What products did you measure in your survey?

20 A. So the products measured appear here on CDX-9.6.
21 And in my survey, I measured five Amazon devices, ten HP
22 computers, and you see on the right-hand side, I measured
23 three individual products from Microsoft and Samsung, the
24 domestic industry products.

25 Q. Let's talk about the behaviors that your survey

1 measured.

2 A. Yes. So the behaviors measured in my survey I
3 refer to here on CDX-9.7 as focal behaviors. I may also
4 refer to these today as focal questions. And, importantly,
5 each focal question is preceded by one or more questions
6 that qualify respondents to be -- or survey participants to
7 be able to see each focal question.

8 Furthermore, each focal question placed an
9 emphasis on one specific behavior that I understand to be
10 relevant in this matter.

11 Q. So now turning to Question 4 -- thanks,
12 Mr. Moreno -- this relates to the Amazon products.

13 Could you explain more details about the types of
14 behaviors that you captured here for Question 4?

15 A. Yes, absolutely. So Question 4 measures Amazon
16 Prime video uses, and specifically it focuses on the ways
17 that consumers may have interacted with certain movies or TV
18 shows on Amazon Prime Video while using an Amazon device.
19 And the focal measure here reads as "I watched all or part
20 of it, or watched any preview."

21 And we see here that that measures 56.5 percent
22 of Amazon device users.

23 Q. Now, I see here at the bottom of the table,
24 toward the bottom of the table, that it reads "I converted
25 to a green screen video."

1 What does that mean?

2 A. Yes. This particular entry relating to green
3 screen video was one of a number of additional options that
4 appeared in this question, but this particular item is what
5 I referred to earlier as a survey control. Briefly, survey
6 controls enable researchers to account for extraneous
7 factors that could ultimately influence an individual's
8 answers. It may be due to preexisting beliefs. It may be
9 due to an individual's tendency to yea-say or acquiesce in a
10 survey. And researchers would refer to that as survey
11 noise. And this provides such a measure.

12 Q. Is that an actual feature of Prime Video?

13 A. Oh, no. And it's important to note that this, to
14 my understanding, is certainly not a known feature on Amazon
15 Prime Video, but as a survey control, it's important that
16 it's also something that could be plausible in the minds of
17 consumers. And so this measure is used as a proxy, if you
18 will, for survey noise to subtract from the focal measure.

19 Q. And do you have these control answers for each of
20 your focal questions?

21 A. Yes, I do. So each focal question includes an
22 individual control response that I subtract from that focal
23 measure.

24 Q. So now looking back to this table, we see at the
25 very bottom, it says "net measure." What's that?

1 A. Yes. The net measure, it's a very simple
2 calculation. I'm simply taking the control, in this
3 instance 1.3 percent, and I'm subtracting that from the
4 focal measure of 56.5. And so the net measure is
5 55.2 percent, from which I conclude that a meaningful number
6 of consumers are engaging in behaviors on Amazon Prime video
7 that I understand are relevant in this matter.

8 Q. Now, 55.2, does that mean that 44.8 percent did
9 not use H.265?

10 A. No, it does not. The 44.8 percent that you were
11 referring to actually pertains to those respondents who did
12 not indicate engaging in a specific behavior for a specific
13 product. Due to the conservative design of my survey, it's
14 quite possible that individuals in the marketplace are using
15 H.265. So, for example, in Question 4 as we see here, it's
16 quite possible that an individual watched a video using
17 H.265 that was not one of the select focal video titles that
18 I included in my survey.

19 Q. Let's talk about the next focal question,
20 Question 6.

21 What were you measuring --

22 A. So --

23 Q. Pardon me, Dr. Botner. Tell us about it.

24 A. Yes. So Question 6 measures Microsoft computer
25 video uses. And the focal measure here is watching one or

1 more videos on that Microsoft computer that was recorded on
2 that Microsoft computer.

3 And after accounting for the control, I find a
4 net measure of 27.3 percent, which, again, I feel provides a
5 meaningful measure reflecting behaviors that I understand to
6 be relevant in this matter.

7 Q. Moving to the next slide, tell me about this next
8 measure, the one for Question 10.

9 A. Yes. So Question 10 measures HP and Microsoft
10 uses along with Samsung Galaxy phone. So the focal measure
11 is, as noted, using a USB cable, but it's individuals who
12 transferred videos that were recorded on their Samsung
13 Galaxy phone to an HP or Microsoft computer using a USB
14 cable.

15 And we see here, after accounting for the
16 control, the net measure is 20.3 percent of HP computer
17 users and 35.6 percent of Microsoft computer users. And,
18 again, here, I find that a meaningful number of consumers
19 are engaging in behaviors that I understand to be relevant
20 in this matter.

21 Q. And moving to the next slide, here you included
22 data responsive to two questions. Tell me about that.

23 A. Yes. So here on CDX-9.11, you see Questions 16
24 and 19, which measure video editing use on Microsoft -- I'm
25 sorry, yes, Microsoft and HP devices. And it's important to

1 note that both of these questions pertained to software
2 applications, video editing programs that fall under the
3 Adobe brand umbrella. So given the related nature of these
4 programs, these are noted here on this slide.

5 And the focal measure is watching one or more of
6 the H.265 videos that they worked with using these specific
7 video editing programs from Adobe. And after accounting for
8 the control, I find a net measure of 1.4 percent of HP
9 computer users and 4.8 percent of Microsoft computer users.

10 And allow me to point out, these numbers, these
11 are lower, relatively speaking, from the previous numbers
12 that I've discussed, but given my research on this software.
13 In my research in this matter, I understand these to be
14 video editing programs that are tailored to, I'll call it, a
15 more niche audience of advanced video editing users.

16 Q. Let's go to your last focal question, and that's
17 Question 21. What does Question 21 show?

18 A. So Question 21 was somewhat similar to the
19 previous series of questions that I just discussed. And
20 here on CDX-9 .12, you see that Question 21 measures Media
21 Player program use on HP and Microsoft devices. As before,
22 the focal measure here is watching one or more H.265 videos
23 that they worked with using the specific software program of
24 VLC Media Player.

25 And after accounting for the control, I find a

1 net measure of 3.0 percent for HP computer users and
2 5.4 percent for Microsoft computer users. And, again, I
3 find these to be meaningful numbers reflecting usage that I
4 understand is relevant in this matter.

5 Q. So to summarize, for the accused products, what
6 overall conclusions did you reach from your survey?

7 A. Yes. Allow me to summarize for each product. So
8 for Amazon, 55.2 percent of Amazon device users interacted
9 with certain videos or movie titles in ways that I
10 understand are relevant to this matter.

11 For HP, 20.3 percent of HP computer users
12 transferred a video that was recorded on their Samsung
13 Galaxy phone to their HP computer using a USB cable.
14 1.4 percent watched H.265 videos using one of the Adobe
15 video editing programs. And 3.0 percent watched H.265
16 videos using VLC Media Player.

17 Q. What about for the domestic industry products
18 from Microsoft?

19 A. For the Microsoft products, 27.3 percent of users
20 watched one or more videos that they recorded on that device
21 on that particular device. 35.6 percent transferred a video
22 that they recorded on their Samsung Galaxy phone to their
23 Microsoft computer via a USB cable. 4.8 percent watched
24 H.265 videos using one of the Adobe video editing programs.
25 And 5.4 percent watched H.265 videos using VLC Media Player.

1 Q. Now, Dr. Botner, we previewed at the beginning of
2 your testimony that we were going to discuss two surveys
3 today. Can you tell me about the other one?

4 A. Yes. The other survey that I conducted in this
5 matter measures -- also measures how consumers use certain
6 Amazon and HP products in ways that I understand are
7 relevant, but that particular survey focused on the H.264
8 standard.

9 Q. And what were your conclusions in that survey?

10 A. Yes. So here on CDX-9.14, I've summarized the
11 main conclusions for both accused products and domestic
12 industry products. So for accused products, Amazon and HP,
13 I find between 19.4 percent and 39.0 percent of consumers
14 engaged in relevant behaviors that I understand to be
15 relevant in this matter, and for domestic industry products,
16 between 22.2 percent and 31.3 percent engaged in such
17 relevant behaviors.

18 Q. So how did the H.264 survey differ from the H.265
19 survey?

20 A. From an overarching perspective, they were very
21 similar surveys in terms of methodology and overall survey
22 design. I should note, of course, and I alluded to this
23 earlier, one had the primary focus of H.264; the other had
24 the primary focus of H.265.

25 And, of course, with that, as a researcher, comes

1 a lot of tweaking of -- and nuances to perhaps the language,
2 the behaviors, and the products that are tested.

3 Q. Dr. Botner, for either of your surveys, are you
4 aware of any criticisms from any other survey experts?

5 A. No, I'm not. I'm not aware of any criticisms
6 from a rebuttal expert or a survey expert.

7 Q. Dr. Botner, those are all the questions I have
8 for you right now. Thank you for your time.

9 A. Thank you.

10 MS. SIMENAUER: I pass the witness.

11 MR. HAWKINS: Good morning, Your Honor. Brent
12 Hawkins again on behalf of HP. But I will be
13 cross-examining Dr. Botner on behalf of both Respondents.
14 May I proceed?

15 JUDGE ELLIOT: Good morning.

16 MR. HAWKINS: Thank you, Your Honor.

17 CROSS-EXAMINATION

18 BY MR. HAWKINS:

19 Q. Good morning, Dr. Botner. Good to see you again.

20 A. Good morning. Good morning, Mr. Hawkins. Nice
21 to see you.

22 Q. So just to confirm, Dr. Botner, you're not a
23 technical expert, right?

24 A. I am not a technical expert. I am a survey
25 expert.

1 Q. And you're not an expert in H.264 or H.265?

2 A. I would say the same, I would provide the same
3 answer. I'm a survey expert.

4 Q. Okay. And you're not an expert on how software
5 interacts with hardware?

6 A. No. I am a survey expert.

7 Q. And your survey wasn't designed to determine how
8 a respondent's qualifying hardware interacted with software,
9 right; isn't that correct?

10 A. Oh, certainly. My survey would not have
11 monitored or audited programs on a user's device.

12 Q. Okay. Now, if we could pull up CDX-9.6. I think
13 that was the list of qualifying products from your study.
14 Is that correct, sir?

15 A. CDX-9.6, yes.

16 Q. Okay. That list of Amazon devices, now that's
17 not a complete list of the devices you surveyed, correct?

18 A. This is a complete list of the focal products
19 from Amazon.

20 Q. Well, in your H.264 survey, you also included the
21 Fire Tablet and the Amazon Echo Show as qualifying products,
22 didn't you?

23 A. There were additional products tested in the
24 H.264 survey. This list here refers to the products that
25 were measured in the H.265 survey.

1 Q. Okay. But this doesn't include the Amazon Echo
2 Show or the Fire Tablet, right?

3 A. I would have to confirm the exact products,
4 Mr. Hawkins, but this includes five, and I believe the H.264
5 survey included a couple of additional Amazon products.

6 Q. And when you gave your conclusions about the
7 H.264 survey, that included data from -- about the -- that
8 you received from respondents about the Fire Tablet and
9 Amazon Echo Show, correct?

10 A. Yes, the H.264 summary provides measures from the
11 H.264 survey, which included Amazon products.

12 Q. That aren't listed on this -- on this slide,
13 correct?

14 A. Yes, as I noted, there, I believe, were
15 additional products tested in H.264.

16 Q. And now you know the Amazon Echo Show and Fire
17 Tablets, they have other uses besides watching videos,
18 correct?

19 A. Yes. That's my understanding, yeah.

20 Q. Okay. In fact, you used -- use Echo Show to
21 listen to music and get information; isn't that right?

22 A. I have multi-tasked on that device, yeah.

23 Q. Consumers can do that as well, right?

24 A. I'm a consumer. Yes.

25 Q. Now, this chart also shows the qualifying HP

1 computers included in your survey, right?

2 A. Yes, it does.

3 Q. And you included the HP Chromebook, the Fortis,
4 and the Pavilion computers, right?

5 A. Yes, that's correct.

6 Q. Okay. Mr. Sayres, could you pull up CX-6040.182,
7 please.

8 Now, Dr. Botner, do you recognize this?

9 A. Yes, I see this is Exhibit 6 from my expert
10 report, which provides cross-tabulation results from my
11 survey in the 1380 investigation.

12 Q. And, in particular, this shows, on a percentage
13 basis, respondents' selections for qualifying HP computer
14 products, correct?

15 A. Yes, that's correct.

16 Q. As well as those that qualified for saying they
17 had used, in the last two years, a Samsung Galaxy phone and
18 an HP computer, correct?

19 A. Ah, but Mr. Hawkins, I would -- is it possible to
20 shrink this down such that I can see the specific question
21 number that appears above it? Thank you. Thank you. So --
22 and I can still see this, Mr. Hawkins.

23 But Question F, yes, it does pertain to which, if
24 any, of the following electronic devices have you used in
25 the past two years. And, yes, I just wanted to confirm

1 that, Mr. Hawkins. Thank you.

2 Q. Okay. You see about 27.8 percent of respondents,
3 I think, used an HP Chromebook and .2 percent of Fortis and
4 45.2 percent Pavilion, right?

5 A. Yes.

6 Q. Right? And that's about 73.2 percent, correct?
7 Isn't that right?

8 A. Yes, I mean, generally speaking. Yes.

9 Q. And if we look at the Samsung Galaxy phone and HP
10 computer, 37.7 percent, .5, 45.9 percent is 84.1 percent,
11 correct?

12 A. I'll trust your math, correct.

13 Q. Certainly, you were aware that the -- well, the
14 HP Chromebook, Fortis, and Pavilion are not sold with the
15 HEVC video extensions installed, correct?

16 A. I measured a list of products that I understand
17 to be relevant in this matter.

18 Q. My question was, you were aware that they were --
19 that those products were not sold with the HEVC video
20 extensions installed, right?

21 A. Well, again, as a survey expert, I'm not a
22 technical expert, and I don't know the inner workings of
23 each and every device in the survey.

24 Q. But you included those on your survey anyway,
25 didn't you?

1 A. Yes. As shown here for Question F, these were
2 included in the survey.

3 Q. And you don't know from your survey if any of the
4 respondents of any of the HP computers were configured to
5 execute H.264 or H.265 decoding in the hardware, are you?

6 A. And, Mr. Hawkins, can you clarify "executed"?

7 Q. Use it in any of the functionality in the
8 hardware, sir.

9 A. Okay. Thank you. And, no. No. Again, my
10 survey did not measure specific underlying behaviors that
11 may have been occurring on an individual's device. And
12 while individuals were taking the survey, that device may
13 have been in a different location.

14 Q. Now, you offer conclusions that a meaningful
15 number of relevant consumers use various Amazon and HP
16 accused products in ways that are relevant to the asserted
17 functionalities on these devices. Isn't that right?

18 A. Yes, that's correct.

19 Q. And you didn't provide a threshold for what
20 constitutes a meaningful number, did you?

21 A. No, there is no established threshold for these
22 types of surveys. And I would like to note that it's my
23 understanding that any usage is meaningful.

24 Q. Okay. So you said any non-zero number or
25 percentage is meaningful in your -- according to your

1 analysis; is that correct?

2 A. Yes, that's correct, Mr. Hawkins.

3 Q. All right. Can we pull up CDX-9.13, please.

4 And this reflects the net measured -- the net
5 measured relevant uses in both your -- in your H.265 study,
6 correct?

7 A. Yes. CDX-9.13.

8 Q. And your summary shows that only 1.4 respondents
9 reported using one of the Adobe -- one of the Adobe
10 softwares, right?

11 A. Yes, that's correct.

12 Q. Okay. And that includes -- that number includes
13 respondents that qualify because of their indicated use of
14 the HP Chromebook, Fortis, and Pavilion; isn't that correct?

15 A. Yes, those individuals -- so the denominator of
16 this measure includes all of the individuals that qualified
17 to be asked about this particular device.

18 Now, I do want to note that it also includes
19 individuals who simply did not proceed through the focal
20 questions specific to this behavior to be -- to be even
21 asked the focal question. So in the denominator is a number
22 of users who may not be aware of what video compression
23 formats are. They may not have claimed using H.265. They
24 may not have claimed using Adobe.

25 Q. Okay. Thank you. But my question to you was did

1 that number, that 1.4 percent, that 1.4 percent, did that
2 include users or respondents that qualify for using either
3 the Chromebook, the Fortis, or Pavilion? That would be
4 right, right?

5 A. Yes, the 1.4 percent is HP computer users as
6 measured in my survey.

7 Q. And so 97 percent of your respondents -- and that
8 sample size was 825 respondents, didn't report even watching
9 an H.265 video using the Adobe product, right?

10 A. I'm sorry. The number was what again,
11 Mr. Hawkins? Did you say 97?

12 Q. Yeah. So we have the 1.4, right --

13 A. Correct.

14 Q. -- for the Adobe products, 3 percent for the VLC
15 Media Player products.

16 A. Yes.

17 Q. So the high level was 3 percent that used any
18 video playback, right, on an HP computer, correct?

19 A. Well, you mentioned that -- the 97 percent. And
20 those are, again, individuals who did not engage in this
21 specific behavior on a specific device.

22 Q. Okay. Now, can we flip to CDX-9.14, please.

23 And we want to go back to your numbers there, on
24 the Amazon numbers. Do you see that, the first line?

25 A. Yes, I do. H.264 results, CDX-9.14.

1 Q. And, again, that 19.4 includes the Amazon and
2 Echo, the Show Fire Tablet, and the Fire Max 11, and -- the
3 Fire Max, correct?

4 A. Yes. And, again, I would want to refer to see
5 which specific products, but, yes, there were additional
6 products comprising this 19.4 percent.

7 Q. Okay. And that sample size was about -- was 155
8 respondents, correct?

9 A. I would have to confirm, but that does sound like
10 it's in the ballpark, yes.

11 Q. Do you need to confirm it?

12 A. I would like to confirm.

13 Q. Okay. Could you bring up RDX-122, please. I'm
14 sorry. I'm sorry, not 122. Could you bring up RDX-123.
15 120.3, please. No, 120.3. Sorry, Mr. Sayres. There we go.
16 Does that help you, sir?

17 A. Yes, it does. On the right-hand side for Q4, I
18 see the sample size of 155. Thank you.

19 Q. And 19.4 of those 155 participants were all that
20 reported engaging in behaviors that you identified as a net
21 measure of asserted usage relevant to the H.264 standard,
22 right?

23 A. Yes, that's correct.

24 Q. So it's roughly 80 percent that did not; isn't
25 that right?

1 A. 80 percent, but allow me to clarify. It's
2 individuals that did not engage in that specific behavior on
3 that specific device.

4 Q. Correct. The number that you reported, correct?

5 A. Yes, correct.

6 MR. HAWKINS: I have no further questions at this
7 time. I pass the witness.

8 MS. DUCCA: No questions from Staff, Your Honor.

9 JUDGE ELLIOT: Very well. Ms. Simenauer?

10 MS. SIMENAUER: Your Honor, no further questions.

11 JUDGE ELLIOT: Very well.

12 Dr. Botner, thank you very much.

13 THE WITNESS: Thank you.

14 (The witness stood down.)

15 MR. STEVENSON: Good morning, Your Honor.

16 JUDGE ELLIOT: Good morning.

17 MR. STEVENSON: Ted Stevenson for Nokia. And as
18 our next witness, we call Dr. Mike Akemann.

19 Whereupon--

20 MICHAEL AKEMANN,

21 having been first duly sworn/affirmed, was examined and
22 testified as follows:

23 THE WITNESS: I do.

24 JUDGE ELLIOT: I'm sure I'm going to start
25 sounding like cranky, but I have to say that I don't really

1 see any reason why Dr. Botner testified. I think that if
2 there's an issue of do people who buy the accused products
3 use them the way they're intended, you should have been able
4 to come up with a stipulation about that instead of having
5 live testimony. I just -- I mean, I can virtually take
6 official notice that if I buy something that streams media,
7 that I'm going to stream media with it in a manner that may
8 contribute to indirect infringement. In any event, that's
9 water under the bridge now. All right.

10 Go ahead, sir. And, I'm sorry, tell me your
11 name, sir?

12 MR. STEVENSON: Ted Stevenson. Thank you, Your
13 Honor.

14 DIRECT EXAMINATION

15 BY MR. STEVENSON:

16 Q. Good morning, Dr. Akemann. Will you please
17 introduce yourself to the Court.

18 A. My name is Michael Patrick Akemann.

19 Q. And please tell us what you were retained to do?

20 A. I was asked to assess from an economic
21 perspective whether Nokia's offers to HP and Amazon were
22 consistent with RAND principles.

23 Q. Right. Dr. Akemann, please run through your
24 educational and work experience, please.

25 A. Sure. I've got a BA in economics and political

1 science from the University of California at San Diego. I
2 went on to get a Master's degree and a Ph.D. in economics at
3 UCLA. I'm currently a managing director at a company called
4 Berkeley Research Group, where I've been engaged in economic
5 research and consulting for the past 25 years or so.

6 A significant focus of my practice has been on
7 antitrust and intellectual property issues, including a lot
8 of matters here before the ITC.

9 Q. Have you previously been accepted as an expert on
10 economics with regard to value of standard essential
11 patents?

12 A. I have.

13 Q. And, In fact, were you accepted in the 1379
14 investigation on that topic as an expert?

15 A. I was.

16 Q. Is slide 3 your current CV or at least relatively
17 current?

18 A. It is.

19 MR. STEVENSON: Your Honor, we'll tender
20 Dr. Akemann as an economic expert related to patent
21 licensing and RAND compliance.

22 MR. BADER: No objection from Respondents.

23 BY MR. STEVENSON:

24 Q. Dr. Akemann, I don't want to get into rehashing
25 all your testimony from 1379 because I know that's part of

1 the record here by agreement, but I think it may be useful
2 to the Court to have a very quick recap on a couple of
3 points to orient the Court to your testimony here.

4 First, which Nokia asserted patent claims do you
5 understand are subject to a RAND commitment and, therefore,
6 impacted by your testimony?

7 A. The decoding claims related to the H.264 and
8 H.265 standards.

9 MR. STEVENSON: At this point, Your Honor, I'm
10 going to have to request that we seal the Court for
11 third-party confidential information, which means Amazon and
12 HP corporate representatives will have to excuse themselves.
13 But Nokia can remain.

14 JUDGE ELLIOT: Very well.

15 (Whereupon, the hearing proceeded in confidential
16 session.)
17
18
19
20
21
22
23
24
25

1 O P E N S E S S I O N

2 BY MR. STEVENSON:

3 Q. All right. So, Dr. Akemann, after criticizing
4 the comparable licenses that you relied on, Respondents'
5 experts have suggested, in lieu of those, that you should
6 have based your valuation of Nokia's portfolio based on some
7 pools, some patent pools for video coding technology.

8 Do you feel that's a sound approach here?

9 A. No.

10 Q. Why not?

11 A. Two overarching reasons. First, Nokia's patents
12 aren't part of the pools that the Respondents' experts
13 looked at. Nokia could have chosen to add its patents to
14 the pool. It didn't. And nothing has been done to
15 establish that the pool patents are comparable to Nokia's
16 patents.

17 Secondly, the pools that Respondents' experts
18 focus on, in my view, don't directly value the patents in
19 those pools.

20 Q. Well, let me stop you there and ask you to
21 explain. Why do you testify that the pools don't directly
22 value the patents that they're licensing?

23 A. Well, we can look at the history of those pools
24 and their rate structure. Those pools that the Respondents'
25 experts focus on, MPEG LA in particular, was founded

1 primarily by large implementers who were interested in
2 low-price cross-licenses.

3 Q. Well, how do they get low-price cross-licenses by
4 undervaluing the royalties for a pool?

5 A. Well, when they form the pool, they set a
6 particular rate and, in this case, a rate structure. They
7 don't change it over time, even though more patents are
8 added to the pool, more licensors are added to the pool.

9 Q. Have you seen any empirical evidence that
10 corroborates what you're testifying to right now?

11 A. I have.

12 Q. Tell us what's on slide 12.

13 A. Well, this slide reflects exactly what I was just
14 describing. The rates have stayed constant, even though the
15 pool size has expanded dramatically. So if we look at the
16 left side of this slide, around the formation of the MPEG LA
17 patent pool, there were 84 patents and 18 licensors. And
18 the main rate in that agreement was 20 cents, not euro
19 cents.

20 And that hasn't changed over a 20-year period,
21 even though the number of patents has exploded to more than
22 1800 and the number of licensors is now over 40.

23 Q. But one more factor, though, Dr. Akemann.

24 Isn't it true, though, that they have an
25 enterprise cap in these pools?

1 A. That is true.

2 Q. And hasn't that increased over time? I think it
3 was 3.5 million in 2005, and in 2024, now it's 9.75 million.

4 How do you account for that increase and square
5 that with your opinions?

6 A. Well, in a couple of ways. First, the existence
7 of a cap means that large implementers aren't actually
8 paying anything on the margin when they use the patents in
9 these pools because once they hit the cap, there's no more
10 royalty rate. They pay zero on the margin.

11 And although it's true that there is a cap and it
12 has gone up by about a factor of 2 and a half, over 3 over
13 time, the number of patents has grown by more than 20. And,
14 importantly, the unit rate, that 20 cent rate, hasn't
15 changed over the entire period.

16 Q. What incentives would pools have to give this
17 enterprise cap discount to large companies that sign up?

18 A. Well, again, it's part of this desire to motivate
19 low-price cross-licenses and to encourage large
20 implementers, who often have large patent portfolios, to
21 join the pools.

22 Q. Last couple of questions, Dr. Akemann, and then
23 I'll pass you.

24 Have any of the pool members of MPEG LA or the
25 other pool, Access Advance, actually licensed directly

1 bilaterally from Nokia?

2 A. They have.

3 Q. Okay. And what does that tell you as an
4 economist?

5 A. It gives me confidence that Nokia's rates in the
6 marketplace have been validated by informed licensed --
7 licensing participants. So when you have large entities
8 taking licenses from both the pools and from Nokia, that
9 gives me added confidence that Nokia's own comparable
10 licenses are a very good benchmark for assessing RAND.

11 MR. STEVENSON: Thank you. I pass the witness.

12 MR. BADER: Good morning, Your Honor. Martin
13 Bader on behalf of the Amazon Respondents. We have a cross
14 binder that we're bringing up right now.

15 May I proceed?

16 JUDGE ELLIOT: Go ahead.

17 MR. BADER: Thank you.

18 CROSS-EXAMINATION

19 BY MR. BADER:

20 Q. Dr. Akemann, in the 1379 investigation, the
21 patents being asserted there were H.264 patents, right?

22 A. I think that's correct.

23 Q. And in that case, we discussed your calculation
24 of a benchmark for the H.264 portfolio for Nokia.

25 Do you recall that?

1 A. I do.

2 Q. Yeah. And so in this case, we've got H.265
3 patents. So I'd like to focus today on your analysis of
4 Nokia's benchmark that you calculated for the H.265
5 standard. Is that all right?

6 A. Okay.

7 Q. Okay. So in your opinion, 60 euro cents is a
8 RAND benchmark for Nokia's H.265 portfolio, right?

9 A. It is. It's part of my range.

10 Q. And in coming to that benchmark, you relied on
11 Nokia's running royalty license agreements that were
12 covering H.265 patents?

13 A. In part, yes.

14 Q. And -- correct, right? You also relied on a few
15 lump-sum agreements?

16 A. I did.

17 Q. And those were the four agreements you just
18 discussed, right? The Samsung, Roku, Bosch, and GoPro
19 agreements?

20 MR. STEVENSON: Your Honor, I hate to interrupt,
21 but may I point out we're on the public record? We may be
22 getting into confidential record.

23 MR. BADER: I will be quickly going on the
24 confidential record. If we want to just do it right now,
25 that's fine. I just have a few more questions. And then

1 we'll have to go anyway.

2 JUDGE ELLIOT: It's possible these four
3 agreements you just talked about could be confidential. Are
4 they?

5 MR. STEVENSON: The existence of them is not
6 confidential, but the terms of them and how they, of course,
7 factor into the analysis would be, I think, by the third
8 parties considered confidential.

9 JUDGE ELLIOT: Very well. All right. Well, I'll
10 ask you to just be cautious, and let's go on the
11 confidential record when appropriate.

12 MR. BADER: Thank you.

13 BY MR. BADER:

14 Q. So in coming to your benchmark for H.265, you
15 made no attempt --

16 JUDGE ELLIOT: Hold on. Let's stay public.

17 Okay. Go ahead.

18 BY MR. BADER:

19 Q. Sorry. So in coming to your benchmark for the
20 H.265 portfolio, you made no attempt to determine which
21 parts of the H.265 standard are covered by the patents in
22 Nokia's portfolio?

23 A. That's correct. I didn't do any kind of
24 technical analysis like that.

25 Q. And you made no attempt to determine how much of

1 the H.265 standard is covered by the patents in Nokia's
2 portfolio?

3 A. That's correct. No technical analysis.

4 Q. And you did not do a quantitative analysis
5 regarding how important Nokia's H.265 patents are compared
6 to any other third-party licensors' patents for the H.265
7 standard?

8 A. That's true.

9 Q. And that includes patents in the Access Advance
10 and MPEG LA H.265 pools, right?

11 A. I looked at those pools, but I didn't do a
12 comparison across the two from a technical perspective.

13 Q. Exactly. So you didn't attempt to quantify the
14 value of compression benefits of the H.265 standard as a
15 whole either, did you?

16 A. That's correct, not the standard as a whole.

17 Q. And you didn't do any analysis to determine how
18 much of that benefit was attributable to Nokia's H.265
19 patents?

20 A. Not in any sort of top-down sense, if that's what
21 you're asking.

22 Q. Okay.

23 MR. BADER: And, Your Honor, at this time, we
24 will be discussing third-party confidential information. I
25 believe, other than Nokia's representatives, everyone else

1 should probably be removed from the courtroom.

2 JUDGE ELLIOT: Very well.

3 (Whereupon, the hearing proceeded in confidential
4 session.)

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 BY MR. LEVY:

3 Q. Have you seen evidence in here in terms of the
4 approximately 15 percent activation rate in HP laptops of
5 H.265?

6 A. I certainly recall hearing that about that in the
7 1379 investigation.

8 Q. Would you agree that the fact that HP has a low
9 activation rate on H.265 in its laptops and that -- you may
10 also recall hearing in the 1379 that HP also has taken steps
11 to disable H.265 in the hardware on its laptops, that that
12 indicates that Nokia's licenses could be supra-FRAND and
13 above FRAND rates? Would you agree with that?

14 A. No, I wouldn't agree with that.

15 Q. Okay. So let's just, to clarify what you said in
16 your deposition, which was the -- June 11th, when was day
17 two of your deposition in the 1379, and going to page 436,
18 line 4.

19 I said: "Would you take the actions by HP to
20 disable H.265 as an indicator that Nokia is demanding a
21 supra-FRAND rate for H.265?"

22 And your answer was: "It could be consistent
23 with that, I suppose."

24 A. I see that.

25 Q. Okay. Now, you know what a top-down analysis or

1 royalty stack analysis is in terms of FRAND. It's another
2 way to do a FRAND analysis, right?

3 A. I do know that.

4 Q. Okay. And you didn't do a top-down royalty stack
5 analysis for either H.264 or H.265 or the combined
6 portfolios, did you?

7 A. That's correct.

8 Q. Would you agree that it would be unreasonable for
9 a royalty stack for H.264 or H.265 to equal 50 percent of
10 HP's average profit margin for each laptop?

11 A. I'm sorry, that would be unreasonable? Could you
12 just rephrase or restate?

13 Q. Do you agree it would be unreasonable that if you
14 had done a royalty stack analysis and the result was using
15 your benchmark, that 50 percent of HP's profits would be
16 attributable to H.264 or H.265, that that simply is too high
17 for just one standard on a laptop that has so many standards
18 and non-standardized technology in it?

19 A. I haven't done that analysis here, so I don't
20 have an opinion on that one way or the other.

21 Q. What about 90 percent, would you agree that if,
22 for example, H.265 resulted in 90 percent of HP's profit for
23 a laptop, that that would be unreasonable and would indicate
24 that the starting FRAND number would be too high?

25 A. Again, I haven't done any analysis of that sort,

1 so I don't have an opinion on that issue here.

2 MR. LEVY: No further questions, Your Honor.

3 MS. DUCCA: Good morning, Your Honor.

4 MS. DUCCA:

5 Q. Good morning, Dr. Akemann. My name is Marissa
6 Ducca from OUII.

7 MS. DUCCA: And I'm going to start out -- I just
8 have a few questions, but I'm going to start out on the
9 Nokia confidential record, and then I'll switch to the
10 public record.

11 JUDGE ELLIOT: Very well.

12 (Whereupon, the hearing proceeded in confidential
13 session.)

14

15

16

17

18

19

20

21

22

23

24

25

1 O P E N S E S S I O N

2 BY MS. DUCCA:

3 Q. Dr. Akemann, in your experience as an economist,
4 is it common for royalty rates to be established through
5 negotiations with -- between private parties?

6 A. Definitely.

7 Q. Have you seen any evidence that the licenses you
8 reviewed in this case were generated or not generated under
9 the threat of litigation?

10 A. No, nothing directly related to that. And in
11 this case, there were no lawsuits filed before any of these
12 running royalty rates were struck, at least that related to
13 the video patent portfolios that we care about here.

14 Q. So that didn't factor into your analysis at all,
15 whether or not they were established under the threat of
16 litigation?

17 A. Well, I considered the possibility and looked for
18 any direct evidence that that might have been a problem.
19 And as I explained in my direct testimony, there's costs on
20 both sides. And I think there's no reason to assume they
21 wouldn't do anything other than approximately balance out
22 here.

23 Q. As an economist, is it your opinion that it's
24 unusual for a business to try to maximize the amount of
25 royalties they can receive?

Heritage Reporting Corporation
(202) 628-4888

1 A. We normally assume that companies involved in
2 licensing activities are trying to maximize profits or
3 obtain a reasonable rate of return on their efforts.

4 Q. So there's nothing wrong with, in your opinion as
5 an economist, with a company trying to maximize profits?

6 A. No. It's what we assume and expect, and it's
7 kind of how the system works. That's what provides
8 incentives to innovate, develop new IP, and new products.

9 Q. Thank you, Dr. Akemann. That's all of my
10 questions.

11 A. Thank you.

12 JUDGE ELLIOT: Mr. Stevenson?

13 MR. STEVENSON: Thank you, Your Honor.

14 REDIRECT EXAMINATION

15 BY MR. STEVENSON:

16 Q. Can we put up, please, demonstrative slide 9 that
17 I used with Dr. Akemann. I want to ask you about some of
18 the licenses and some of the dollar amounts.

19 Okay. This is the chart that you looked at on
20 cross-examination, some cross-outs. Let's talk about some
21 deals that weren't crossed out.

22 MR. STEVENSON: And if we can go on the
23 confidential Nokia record, please.

24 JUDGE ELLIOT: Shouldn't we be on the public
25 record?

1 MR. STEVENSON: We should be on the confidential
2 Nokia record.

3 JUDGE ELLIOT: Very well.

4 (Whereupon, the hearing proceeded in confidential
5 session.)

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 JUDGE ELLIOT: Yes, sir. Tell me your name, sir.

3 MR. VERBONCOEUR: Mitch Verboncoeur on behalf of
4 Nokia.

5 And, Your Honor, I know there was some talk of an
6 objection to the demonstratives. I am not sure if
7 Respondents still intend to object, but we might handle that
8 before Dr. Moulin goes on the stand.

9 JUDGE ELLIOT: Was this the witness? All right.
10 Come on up, sir. And tell me your name too, please.

11 MR. CANAVERA: Your Honor, Kyle Canavera for
12 Amazon.

13 So, Your Honor, we have an objection to a series
14 of three slides that Dr. Moulin has. The slides, just to
15 note at the start, are slides 23, 24, and 25. I would like
16 to first, though, pull up the claim language this relates
17 to.

18 Could we bring up claim 25 of the '267 patent.

19 So the issue relates to whether Dr. Moulin is
20 going to give opinions and whether the slides contain
21 opinions outside the scope of his infringement report. It
22 is for the second to last claim element. It says "decrease
23 a precision of said combined prediction by shifting bits."

24 The issue is shifting bits to decrease precision.
25 That's what the claim has. Nokia has in their case pointed

1 to that language and one of the coding specs for satisfying
2 that element.

3 Respondents have said since discovery, since our
4 non-infringement contentions, that Nokia, the shift you're
5 pointing to is not the shift you think it is. It's a
6 special type called arithmetic shift.

7 Can we bring up that ROG response?

8 We explained it at length. This is from
9 non-infringement contentions. But let me just highlight,
10 like, the kernel of this. Halfway down do you see the
11 sentence that starts with "however?" Could we highlight
12 that? After 237.2. Yeah.

13 It says, however, it is understood that the
14 length of the bit representation of a pixel remains the same
15 before and after an arithmetic right shift. We said Nokia,
16 the thing you're pointing to is not a regular shift, it's an
17 arithmetic shift. That does not change precision as the
18 claim requires.

19 The next sentence ties it directly to the claim
20 language.

21 JUDGE ELLIOT: Okay. Hold on. I'm sorry. Let
22 me read this whole paragraph.

23 All right. Go ahead.

24 MR. CANAVERA: So this has been our argument,
25 that they've pointed to the word "shift." We said there's

1 different types of shifts. The one you're looking at is an
2 arithmetic shift, it does not change precision. We haven't
3 gotten a response to that, until it looks like we're going
4 to get that today.

5 Just for an example, could we bring up paragraph
6 683 of Dr. Moulin's infringement report?

7 So if we can highlight just that last clause, the
8 combined prediction is shifted to the right to decrease the
9 precision. This sort of language appears a lot in his
10 report. It just states the conclusion. Shifting decreases
11 precision. He doesn't address our argument that it's
12 actually an arithmetic shift they are looking at, or that an
13 arithmetic shift does not decrease precision. They just
14 don't respond to that.

15 We raised that again in our non-infringement
16 report. We have never seen a response to that. So now let
17 me go back to the slides we're objecting to, and show Your
18 Honor why.

19 First, let me just show the slide they actually
20 have on this claim element. Can we bring up CDX-12C.55.

21 JUDGE ELLIOT: Before you do that, I'm sorry.
22 Can you move -- go back to that previous? Okay. Can you
23 show me page 312 of the expert report, please?

24 I'm sorry, the next page also, 313, please.

25 All right. That's fine. Okay. Go ahead, Mr.

1 Canavera.

2 MR. CANAVERA: So if we go to the demonstratives
3 now, if you bring up 55, briefly. So we do not object to
4 this slide. This is the slide on that claim element.

5 Just to show Your Honor, this is very similar to
6 his report. We don't see anything about arithmetic shifts.
7 We don't see anything connecting arithmetic shifts to
8 precision. We're not objecting to this. Let's go back to
9 the slides we do object to, the sequence 23, 24, 25.

10 So can you just kind of flip through these first
11 and then we will go back? So what we have here is it
12 appears that Dr. Moulin couching it as a tech tutorial-type
13 discussion. But here's the key thing. Let's look at 24.

14 What you see on the left with these bits and
15 these registers and those arrows, that is an arithmetic
16 shift. It may not jump off the page at you, Your Honor, but
17 we discussed it with Nokia. They don't dispute that what
18 they are showing right there is an arithmetic shift. It is
19 the way those arrows are arranged, the way it gets moved.

20 If you look at the top of the slide, it says
21 decreasing precision and binary representations of integers.
22 The bottom of the slide, they talk about the range. And as
23 you're going to hear, I suspect, they connect range to
24 precision. It's a component of precision.

25 So sort of buried in the tech tutorial, we're

1 going to hear for the first time a rebuttal to our
2 non-infringement position about why they think an arithmetic
3 shift decreases precision. And that's why we object to
4 these three slides.

5 JUDGE ELLIOT: Okay. So you object to 24, 25,
6 and 26, is that it?

7 MR. CANAVERA: 23, 24, 25.

8 JUDGE ELLIOT: Okay. And please show me 25.

9 Mr. Verboncoeur?

10 MR. VERBONCOEUR: Mr. Moreno, can you please
11 bring up JX-7 at column 14, line 25, but you can show the
12 surrounding area as well, please.

13 Those equations right there, please, from lines
14 18 or so to 25.

15 So, Your Honor, our understanding is that there
16 is -- the argument the Respondents are making is there is an
17 arithmetic right shift which preserves sign. It can tell
18 you whether you still have a negative number or a positive
19 number versus a logical right shift, which does not.

20 Our understanding is that an arithmetic right
21 shift is written as two carets. And so you see in the
22 highlighted equation here, there is two carets 6. That is a
23 right shift 6. And since there are two carets, it preserves
24 the sign, it's an arithmetic shift. These are the equations
25 from the patent.

1 Now what I would like to do, Mr. Moreno, is have
2 you pull up pages 312 to 313 of Dr. Moulin's opening report.
3 And if you can, display them side-by-side.

4 If we can maybe just zoom in on, for example, the
5 equation at the top. It is more complicated because we have
6 variable names like predSamples and stuff rather than just
7 pred, but you will see the same two carets. Those are the
8 same carets from the patent. They are also the same carets
9 displayed on slides 22, 24, and 25 -- or 23, 24, and 25. So
10 we have an arithmetic right shift.

11 Dr. Moulin does not use the word "arithmetic" but
12 he is accusing that equation. He's pointing to that
13 equation and saying that's the right shift of the claims.
14 That's what decreases the precision.

15 And if you can zoom out again. And then, again,
16 here with the equation 8-279 we see the same thing. Now
17 instead of doing a shift2, we're doing a right shift but it
18 is based on some weights that are signalled in the
19 bitstream.

20 And then we can see the same thing on page 313 of
21 Dr. Moulin's report. We have the double carets. If you
22 look at the equation right there, we have the double carets,
23 and N is some number that we're right shifting by.

24 So I think it's quite clear that Dr. Moulin was
25 saying this particular function is shifting bits and that's

1 decreasing the precision. And now if we could go to Dr.
2 Moulin's demonstrative slides 23 -- we can start with 23.

3 This is just binary representations of numbers.
4 This doesn't involve shifting at this point. And it's just
5 pointing out how you can figure out what 4 bits, what number
6 you have.

7 Then let's go to slide 24. Here we have a right
8 shift. This is a toy example. In video coding we're going
9 to use far more bits than just four. And we have the same
10 two carets. And we use a 1 there rather than a number like
11 6 or based on some variable signal in the bitstream because
12 we want the toy example in the technical background, which
13 isn't being offered as evidence but just to explain
14 mathematically how this works.

15 Again, on 25, the difference here is we're just
16 using odd numbers versus even numbers in the slide before.
17 And now, Mr. Moreno, if you could please go to paragraph
18 456.

19 Now, counsel for Respondents made a comment about
20 range. You see negative 4 to 3, and there's 8 possible
21 values there. So if we could please have paragraph 456 of
22 Dr. Moulin's report.

23 So what we see here in paragraph 456 after some
24 testing evidence with filters that create large values is
25 the number of bits. So instead of four, you know, zeros and

1 ones, we now have ten. And rather than a range of, you
2 know, eight, we now look at numbers between 0 and 1023. So
3 what's on slides 23, 24, and 25 are just toy examples.

4 I'm happy to get into other paragraphs in Dr.
5 Moulin's report that shows how the effect of having a 1 in
6 the last place changes things, but I think these are the
7 same thing. One is just a toy example. One is, of course,
8 the equations that are from H.265 and AV1.

9 JUDGE ELLIOT: All right. Mr. Canavera, if we
10 can, whoever is controlling the screen? Can you call up the
11 patent, the claim, that second to last claim element of the
12 claim that was up?

13 Okay. So the claim requires decreasing a
14 precision by shifting bits of the combined prediction to the
15 right. And I'm not sure -- I'm not sure I understand your
16 distinction between arithmetic shifting and whatever
17 shifting it is you're saying that Nokia is talking about.
18 Because the claim only requires shifting. The code appears
19 to require shifting.

20 So can you elaborate on that for me?

21 MR. CANAVERA: Certainly, Your Honor.
22 Mr. Verboncoeur actually mentioned it, of the types of
23 shifting, the other one that has implicated here is called
24 logical shifting. It is just a different way to move the
25 bits.

1 You're right, Your Honor, the claim says shift.
2 They have pointed to the spec, the coding spec that says
3 shift. That's the point. They have always stopped just
4 there.

5 We took it a level deeper. The arithmetic shift,
6 Your Honor, is the next level response. We said, shift has
7 -- there are different types, and some can change precision
8 and some can't. And arithmetic shift, we said, cannot
9 change precision.

10 They never went a level deeper with us and
11 responded to that. They always just stuck to the word
12 "shift," like Your Honor just noted. They always said the
13 spec says shift, the claim says shift.

14 But now on that slide, Your Honor, they want to
15 talk to you about how an arithmetic shift in particular
16 works. They want to tell us why it decreases precision, but
17 until today, we have never had that opportunity to hear
18 that.

19 JUDGE ELLIOT: Oh, I see. Okay. All right.
20 Mr. Verboncoeur, now I think I understand what the objection
21 is. So I don't completely follow -- you can come to the
22 podium, Mr. Verboncoeur.

23 I don't completely follow exactly why the
24 precision decreases as a result of moving the bits from one
25 side to the right, but the objection is that there was never

1 an explanation for why the precision decreased as a result
2 of that.

3 Obviously I can't follow exactly. I would need
4 to hear from someone to explain this to me, but it looks to
5 me like this sort of tech tutorial that's on these three
6 slides, 23, 24, and 25, is not anywhere in Dr. Moulin's
7 expert report.

8 MR. VERBONCOEUR: We don't have the four-bit
9 example. That is correct, Your Honor. We don't have that
10 four-bit example. I think the equations are equivalent.
11 But let me explain. We accuse shifting. In the standards,
12 it happens to be arithmetic but for us, it doesn't make a
13 difference. Shifting is shifting.

14 And the reason it decreases the precision, for
15 example, if we can have paragraph 685 of Dr. Moulin's
16 report -- actually, let's start with paragraph 605.

17 So what this is describing here is -- what the
18 patent is talking about is bi-prediction. And you may need
19 to do what is called sub-pixel interpolation to figure out
20 your prediction values. At some point, you are going to
21 combine them. That sub-pixel interpolation process, it's
22 referred to here as an 8-tap filter, but you can have other
23 taps.

24 It adds bits to the results which means now we
25 have more bits. And decreasing the precision by shifting

1 bits to the right takes those away. You no longer have
2 those bits, and so you can't represent as many possible
3 values.

4 So the reason we have this here is we're talking
5 about how when you're doing the interpolation process prior
6 to combining the prediction, we're now adding bits. And now
7 let's go to paragraph 685.

8 Well, actually, sorry, I apologize. If you can
9 go right back to that, we can zoom out. If you can zoom
10 out.

11 So what's being described here as shift3 is
12 always equal to 6 shift1, so the integers left by shift3
13 match these values. And there have been -- that has
14 increased. Now we have more bits. So you can now see the
15 results in the bits.

16 So if we started with 10 bits, for example, which
17 is -- there's 10 bit video out there, now we have 14. So
18 that's more bits than we had before.

19 And now let's go to paragraph 685, please.

20 And this is an example. It's similar in AV1.
21 This is from H.265 but now we're talking about the combined
22 prediction. So remember, these are the values that were
23 shown in that table that have the different bit depths that
24 were higher than 10, if we're just using that as our example
25 of bit depth. We're combining them. Now we have more bits

1 than we started.

2 Now we right8 shift to reduce the precision and
3 then we're saying that's then subject to a clipping
4 function, so we know we're in the allowed range, the allowed
5 range refers to the bits to which we shifted. So we started
6 with -- say we have 14 bits, we shift four, we end up with
7 ten. Now we're in range.

8 And in the testing evidence I showed you, there
9 were example ranges for 10 bits, 0 to 1023 was the range.
10 If you could zoom out there, please.

11 And then you can see the same thing for AV1 in
12 paragraph 687, 688. And then can we, after the Judge has a
13 chance to read that, I would like to go to paragraph 818.

14 So this is an example from AV1 talking about how
15 we know -- let me explain some more background. Sometimes
16 you may apply what's called a rounding offset prior to
17 shifting, so that you know whether you round up or down as a
18 result of the decreased precision, as a result of losing
19 bits.

20 That's what is shown on slides 23 to 25 that they
21 are objecting to. But it's applying a rounding offset would
22 cause a 1 in the most significant position lost, that is,
23 you're losing bits, in the right shift to carry to the next
24 most significant position, rounding up values that would
25 have had a fractional part of one-half or more after the

1 division by 2 to the N, N being the shift.

2 So what that is saying is if I have a value of 5,
3 and I right shift it by one, I now have a value of two. I
4 don't have a value of 2.5. That's what it is explaining in
5 the toy example in the demonstrative slides, just an example
6 of that with four bits as opposed to many more bits.

7 JUDGE ELLIOT: Okay. So I will allow Dr. Moulin
8 to testify about what is in his expert report, including
9 paragraph 605 and 818. And 818, I think I follow, but I
10 don't -- it may be that these slides 23 through 25 that you
11 created were intended to be a simplified explanation for
12 what is being talked about in 818, but I don't see it. So I
13 am going to sustain the objection to these slides.

14 MR. VERBONCOEUR: Sorry, Your Honor. Just to be
15 clear, you don't want us to show the slides?

16 JUDGE ELLIOT: No, don't show the slides. And I
17 will entertain objections if -- I mean we will see what
18 happens but I will entertain objections to questions about
19 this, but, I mean, 818, I think I follow, but I don't see
20 the connection to the slides from 818. It is not clear to
21 me that there is -- that is what is going on. But --

22 MR. VERBONCOEUR: Your Honor, if I may. I
23 received a note. Do you mind if I make a comment?

24 JUDGE ELLIOT: Yes. Go ahead.

25 MR. VERBONCOEUR: The top half of the slide, if

1 we assume a value of 1 for shifting one value of one for N
2 is identical to the math on the slides that we used as the
3 toy examples from slides 23 to 25.

4 JUDGE ELLIOT: Well, I'll tell you the problem I
5 am having is the slides show these equations and then they
6 have the result of the equation, which is 4 or 2 or negative
7 4 or negative 2. And I don't get that at all.

8 So I don't see the connection between the slides
9 and what's talked about in 818. If you want to question Dr.
10 Moulin about what is in paragraph 818, that's fair game,
11 obviously.

12 MR. VERBONCOEUR: Okay.

13 JUDGE ELLIOT: Just talking about the slides are
14 not going to be introduced.

15 MR. CANAVERA: Your Honor, just to raise one
16 concern with that, I can raise this later when the testimony
17 is elicited but just to make this simple, paragraph 818 in
18 his report only discusses one claim, claim 29. That claim
19 has been terminated from this investigation. So I am not
20 sure this is fairly within the bounds of his testimony.

21 JUDGE ELLIOT: Okay. Why don't I take that up
22 when you get to it. Because hopefully I will have been a
23 little more educated on this when we get to that point.

24 MR. CANAVERA: Thank you, Your Honor.

25 MR. VERBONCOEUR: Your Honor, Nokia calls Dr.

1 Moulin to the stand.

2 Whereupon--

3 PIERRE MOULIN,

4 having been first duly sworn/affirmed, was examined and
5 testified as follows:

6

7 THE WITNESS: I do.

8 JUDGE ELLIOT: Have a seat.

9 MR. VERBONCOEUR: May I proceed?

10 JUDGE ELLIOT: Yes.

11 DIRECT EXAMINATION

12 BY MR. VERBONCOEUR:

13 Q. Can you please introduce yourself to the Court?

14 A. Yes. Your Honor. My name is Pierre Moulin. I'm
15 a professor at the University of Illinois, Urbana-Champaign.

16 Q. Did you have a set of demonstrative slides to
17 assist your testimony?

18 A. Yes.

19 Q. What is your educational background?

20 A. Can you move to the first slide? I received my
21 Doctoral and my Master's Degree in electrical engineering
22 both from Washington University in St. Louis. And I
23 received my undergrad degree also in electrical engineering
24 from Belgium.

25 Q. What work experience do you have?

1 A. Can you move to slide 3? After my Ph.D. I worked
2 as a research scientist at Bell Communications Research in
3 New Jersey. Then in '96, I moved to the University of
4 Illinois at Urbana-Champaign, where I was a different rank.
5 And I have been a full professor there since 2003. I have
6 also been an affiliate professor in our Department of
7 Statistics.

8 Q. Can you tell us more about your academic work.

9 A. Can you move to slide 4. As a researcher, I'm a
10 part of a large multi-disciplinary research lab called the
11 Coordinated Science Lab at my university. I have also been
12 a member of the Beckman Institute, which is another large
13 multi-disciplinary research lab. I have authored a number
14 of conference papers and articles, book chapters, also a
15 book which is featured here on the right side of this
16 picture.

17 My research has been funded by various
18 governmental agencies, including the National Science
19 Foundation, DARPA, NATO and companies as well.

20 Q. Have you ever been recognized for your academic
21 work?

22 A. If you can move to slide 5.

23 So I have been elected, selected as a fellow of
24 the Institute for Electronics and Electrical Engineers,
25 which is our main organization. I have received numerous

1 awards for both teaching and research.

2 I have been a distinguished lecturer for the IEEE
3 Signal Processing Society. I served on the Board of
4 Governors of different societies. And I have also won twice
5 a best paper award from the IEEE Signal Processing Society.

6 Q. Tell us something about your past research.

7 A. Yes. Can you move to slide 6.

8 So this is an example of my research, image
9 coding including this is actually a paper that won the Best
10 Paper Award. And so that paper introduced another method
11 for image coding.

12 Q. Professor, have you ever taught video coding?

13 A. Yes, a lot.

14 Q. Can we have slide 7. What are you showing us
15 here on slide 7?

16 A. Yes. So this is the first page of a paper I
17 coauthored with Professor Orchard who testified earlier, and
18 both of us have been teaching this course on image and video
19 processing at the University of Illinois. And so we wrote
20 there a paper describing our experience, introducing image
21 and video processing, including coding to students.

22 Q. Are you familiar with the H.265 standard?

23 A. Yes, I am.

24 Q. Do you teach that H.265 standard in your courses?

25 A. Yes. In fact, it's part of that course.

1 Q. Are you familiar with the AV1 specification?

2 A. Yes, I am.

3 Q. And is the AV1 specification also part of that
4 course?

5 A. Yes, it is.

6 Q. Do you have any more recent research areas of
7 interest?

8 A. Yes, let's move to the next slide. Much of my
9 research recently is focused on machine learning, especially
10 the interplay between secret and machine learning. So this
11 is a little example of an automated travel system where the
12 image sensors, they need to capture road signs, pictures,
13 and so on and correctly recognize them.

14 It turns out that an adversary could introduce a
15 little modification to a stop sign, say, and make it to be
16 recognized as something completely different, like a yield
17 sign or speed limit. And that could cause crashes and so
18 on.

19 So my research is about finding methods to detect
20 such attacks and that improve the safety of transportation
21 systems. That's operated based on sensors.

22 MR. VERBONCOEUR: At this time, Your Honor, Nokia
23 proffers Dr. Pierre Moulin as an expert in the field of
24 video decoding and encoding.

25 MR. CANAVERA: No objection.

1 JUDGE ELLIOT: Very well. Very well.

2 BY MR. VERBONCOEUR:

3 Q. Professor, why are you here?

4 A. I'm here to testify about two patents. Let's
5 move to slide Number 9.

6 These are patents '267 and '714. And I am going
7 to demonstrate that both patents are infringed by both
8 Amazon and HP. And I will also talk about how the technical
9 domestic industry practices the patents, specifically
10 Microsoft and Samsung.

11 Q. What claims of the '267 patent do you plan to
12 testify about?

13 A. Let's move to slide Number 10.

14 For the '267 patent, there are two types of
15 claims, encoding and decoding. I will comment, I will talk
16 about the independent claim number 7 and the dependent
17 claims 8 and 9 for encoding, as well as independent claim 25
18 for decoding and dependent claims 26 and 27.

19 Q. What claims of the '714 patent do you plan to
20 testify about?

21 A. Let's move to slide 11.

22 There, there will be two independent claims I
23 will be discussing. Claim 15 is an encoding claim and 23 is
24 a decoding claim.

25 Q. Can you give us a preview of the conclusions you

1 reached with respect to the '267 and '714 patents?

2 A. Yeah. Let's move to Number 12.

3 My opinion is that both patents infringed by
4 Amazon and HP and are practiced by Microsoft and Samsung.

5 Q. Let's have slide 13, please.

6 Before we get into your analysis, is there any
7 dispute on the definition of a person of ordinary skill in
8 the art?

9 A. Both definitions here are substantially similar.

10 Q. Do you qualify as at least a person of ordinary
11 skill in the art under either party's definition?

12 A. Yes.

13 Q. Did you qualify as a person of ordinary skill in
14 the art at the time of the inventions in the '267 and '714
15 patents?

16 A. Yes, I did.

17 Q. Did you apply these definitions to your analyses?

18 A. Yes.

19 Q. Do any differences between the parties'
20 definitions affect any opinions you plan to give?

21 A. No.

22 Q. Are there any claim constructions at issue for
23 the '267 or '714 patents?

24 A. No.

25 Q. I would like to discuss your opinions now. Can

1 we start with the '267 patent.

2 A. Yes.

3 Q. Before we do, is there any technical background
4 that's helpful for us to know in the '267 patent?

5 A. Yes. Let's move to slide 14. Sorry.

6 The crucial part, the crucial concept is motion
7 compensated prediction. So here I'm showing two frames of a
8 video sequence, perhaps two consecutive frames. And if we
9 look at the current picture, so a very standard way to
10 explore temporal redundancy for video coding is to partition
11 the image into blocks as we have heard before.

12 And if you look at the yellow highlighted block,
13 which is part of a moving car, you notice that there is a
14 pretty good matching block in the previous picture. So that
15 will be called a reference picture.

16 And so if the data from the reference picture are
17 known to the decoder, so these data can be used to form a
18 good prediction of the current block in the current picture.
19 And the difference which would be very small can be encoded
20 very efficiently. And so that's a crucial idea for
21 improving the performance of video coders.

22 Q. Why do these predictions result in improving the
23 performance of the video decoders?

24 A. So if we look again at that car, if you move to
25 the next slide, 15, we see on the left this would be a

1 prediction of the current block based on that reference
2 block. And it does not match exactly the current block. So
3 there's a little difference. That's shown as the
4 transmitted residual. And in this simple example, most
5 pixels of that transmitted residual are zero. And the ones
6 that are not are very small. So they are very efficient
7 coding techniques to capture that. And that is a key idea
8 in video encoding.

9 Q. Does the '267 patent talk about motion
10 compensated prediction?

11 A. Yes, it does.

12 Q. Let's have slide 16, please.

13 What does the '267 patent have to say about
14 motion compensated prediction?

15 A. Yeah. So this is just an introduction to the
16 patent. So it introduces the concept of motion compensation
17 that I just described. If you move to slide 17, we see a
18 little bit more detail about the blocks that I was
19 mentioning.

20 Q. I want to ask you about slide 17, but what are
21 you showing us here?

22 A. In slide 17, I want to give a bit more detail
23 about what blocks are. So looking, again, at this yellow
24 highlighted block, it is reproduced above in the top left
25 corner. So there are some pixels, so different colors.

1 These are corresponding to the wheel and the door panel.

2 And so these are color pixels. So on your
3 camera, on your cell phone camera or on your TV they would
4 be represented by red, green, and blue. For video coding,
5 that transform to different space, luma, chroma, this blue
6 and red chroma components.

7 And so if we look at the block in this little
8 example, it's an 8-by-8 block. And the tiny -- every
9 elements are called pixels. That is a contraction for pixel
10 element. So the smallest addressable unit in an image, and
11 so they have in this case for video L, Cb, and Cr
12 components.

13 Q. Can we please go back to slide 14. I want to ask
14 you about something on slide 14.

15 You mentioned there's that yellow arrow there on
16 slide 14 called a motion vector. Can you explain that?

17 A. Yes. So that's a crucial part of video encoding
18 using motion compensation. So to address the reference
19 block, the best match that has been found, one needs to
20 communicate this displacement vector that is shown in
21 yellow. So that the decoder will be able to apply the
22 displacement vector to what it has already to form its
23 prediction.

24 So you need to transmit not only image data but
25 motion vectors to the decoder.

1 Q. Does the motion vector have to point exactly to
2 pixels?

3 A. No. So in the early days of video coding, it
4 did, but that's a coarse approximation. Let's say the car
5 which is a physical object is moving at a certain velocity,
6 say 29 miles per hour. If you normalize time because there
7 is a time difference between the two pictures shown here, if
8 you normalize space in terms of pixel distances, you may
9 have found it corresponds to a displacement of, say, 19.5
10 pixels in between the two frames.

11 So what's a half-pixel, that is something that
12 has to be made sense of.

13 Q. Can we please have slide 18.

14 So you mentioned a location 19.5. What did you
15 mean by that?

16 A. Well, I will explain it soon, but as the patent
17 mentions, there is this notion of fractional pixel accuracy.
18 So that includes half-pixel accuracy that I just mentioned.
19 It also, again, include quarter-pixel accuracy, which is
20 used in modern video coding standards.

21 Q. Can you show us an illustration of what this
22 fractional pixel accuracy looks like?

23 A. Yes. Let's move to slide 19.

24 So there it leads to an example where the block,
25 the current block is small. It is 4-by-4. It is shown by

1 blue pixels on the left in the current frame. And if our
2 motion vector has integer components, would find a match
3 that is shown in red here with a 4-by-4 block of red pixels
4 in the reference frame.

5 And so the displacement there has components 1
6 horizontally and minus 1 vertically. That is easy enough.

7 If we find that we need a half-pixel motion
8 vector, what does that mean, so in this example on the
9 right, the motion vector's components one-half and minus
10 one-half. So now the red pixels there are in between
11 existing pixels in the reference frame. And they have to be
12 computed because they are not there originally.

13 So this is done by interpolation between the
14 existing pixel values.

15 Q. And, Professor, I'm a little confused because you
16 told us that pixels were the smallest addressable unit. How
17 specifically are pixel values calculated if we're pointing
18 to locations between the pixels?

19 A. Well, let's move to slide 20.

20 So this shows, this is a figure from the patent,
21 which is the same as what has been adopted in H.265. If we
22 look on the right side, we have a clear view of the picture
23 on the left side.

24 So the light blue squares and the capital letters
25 like A and B on top represent existing pixels from the

1 current -- from the previous frame, say. And let's say if
2 we look at the top row we need to compute a new pixel,
3 labeled double small a, small a, they both are small a, so
4 that will be an interpolated value to be computed.

5 And typically -- so one way to do it would be to
6 average a and b to the left and to the right, but that would
7 be too simple.

8 So modern video coding standards use what is
9 called longer interpolation filters, maybe with 6-taps, and
10 so we're going to combine the three left neighbors and the
11 three right neighbors of aa to compute a new value. So that
12 would be interpolation using interpolation filters.

13 And the same goes -- if you look at the center of
14 the picture, we have all the small letters, a, b, c, d, to
15 s. And some of these locations are half-pixel but some are
16 quarter-pixel. Like small a and small c, they are said to
17 be at quarter-pixel locations.

18 Q. Is there anything else we should know for the
19 '267 patent?

20 A. Let's move to slide 21.

21 So the '267 patent is called bi-prediction. In
22 my example so far I have mentioned only one reference
23 picture, because the hope is to find a good match from one
24 reference picture. However, there could be two good matches
25 from two different reference pictures.

1 Maybe one from the past; one from the future. So
2 if that -- two good predictions that are possible, this can
3 be exported very efficiently; for instance, by averaging
4 them to reduce compression noise. So it's a well-recognized
5 advantage to have, say, two, possibly even more predictions
6 to improve the prediction of the current block.

7 Q. Please have slide 22.

8 We have two different predictions. How do we end
9 up with just one current picture?

10 A. Yeah. So you need to combine these two
11 predictions. So going back to my -- to our example with the
12 car on the bottom left this is part of the wheel. And let's
13 say we have a first prediction from a first reference frame
14 and a second prediction from a second reference frame.

15 The simple idea could be to combine them by, for
16 instance, averaging, simply averaging the two with equal
17 weights and that combined prediction would be better than
18 the individual predictions. And, therefore, would improve
19 the performance of the video Codec.

20 Q. Can we please have slide 26.

21 Professor, how do these technical concepts we
22 have been discussing relate to the '267 patent?

23 A. Yes. So all these interpolation filtering
24 operation, I mentioned 6-tap filters. They even use 8-tap
25 filters in standards like H.265. They involve

1 multiplications and additions.

2 And so the purpose are this was basically -- this
3 was basically truncate -- the precision was basically
4 truncated. That introduces errors. So the '267 patent
5 finds and introduces a much more efficient way to do this
6 truncations or rounding. And so if you move to slide 27, we
7 see some details of that.

8 In the upper branch, we have what would be a
9 first prediction. And the lower branch is the second
10 prediction from two different reference pictures. So let's
11 look at the top one.

12 So with the first reference frame, and it would
13 be an interpolation filter, it's called a P-tap filter in my
14 example. P was 6 or perhaps 8. This filter then, again,
15 involves multiplication, addition, because numbers have to
16 be rounded at the end refer to rounding offset to either
17 round up or down.

18 And then the idea of the patent is actually to
19 preserve as much as possible the precision there by not
20 doing rounding, say, to the same as the input depth, for
21 instance. So keep this high precision. The same is done
22 with the second reference frame.

23 Then these two predictions are combined, again,
24 at the rounding offset, if needed. And only then you go
25 back to the original input bit depth.

1 Q. Do you know when the inventions of the '267
2 patent were conceived?

3 A. Yeah. So I really want to comment a little bit
4 more before addressing this.

5 Q. I apologize, Professor. What is it you're trying
6 to show us here on slide 27 of the figure?

7 A. So in video coding, bits are precious. Handling
8 them requires storage, requires processing power. So when
9 higher precision is used, it better be necessary.

10 And so that's the reason why there's a lot of
11 rounding in signal processing. And the big contribution of
12 this patent was really to preserve a large number of bits
13 when necessary, as shown before the combining. And only
14 afterwards when the combined prediction is obtained, then
15 you go back to the lower input precision. So that's a key
16 idea.

17 And also the second one is this handling of
18 rounding. As I mentioned, is running up or rounding down.
19 So before it would require some signaling mechanism, and
20 this patent makes it much easier. You really don't have to
21 worry about that. So this is a second big advantage.

22 Q. Thank you, Professor.

23 Do you know when the inventions of the '267
24 patent were conceived?

25 A. Yes. Let's move to slide 28.

1 The priority date is January 7th, 2011.

2 Q. Did the Respondents challenge this priority date?

3 A. No.

4 Q. What if anything were the inventors working on in
5 January of 2011?

6 A. So let's move to slide 29.

7 So at the time, they were -- the development of
8 the H.265, also called HEVC standard was a multi-year
9 process. There were different versions of the standards
10 that were gradually improved. At some point at the time of
11 the invention, there was this so-called high efficiency mode
12 and a low complexity mode.

13 Highlighted in yellow, for instance, is a
14 relevant concept there. So the high efficiency mode was
15 using higher precision, four bits more than the precision of
16 the input. So that really mitigates all these rounding
17 errors and so on.

18 But, of course, it comes at a big cost. You need
19 more processing resources. Then there is the low complexity
20 mode. That one does not do that, but the performance is
21 lower.

22 So a benefit of this patent, of this idea was
23 actually to subsume the two, so on the -- they could be
24 combined into a single one. And we're waiting to see that
25 on the next slide, 30.

1 Q. I would like to ask you about that. So what did
2 the inventors propose to do to solve that problem?

3 A. So the proposal to JCT-VC, which is the main body
4 that was handling this proposal for the standard, the main
5 idea was to harmonize the two configurations showed up,
6 simplified the syntax and the encoder implementation. And,
7 again, have a much better way to combat rounding errors.

8 And that is the proposal they made, also in
9 January to the JCT-VC. We're going to see that on slide 31.

10 Q. What happened, Professor, after the inventors
11 made their proposal to the JCT-VC?

12 A. The proposal was revised shortly after and
13 adopted into what's called a test model, which is basically
14 something that makes it official, so it was accepted by
15 JCT-VC.

16 Q. Can we move on now to your infringement and
17 domestic industry opinions for the '267 patent?

18 A. Yes.

19 Q. Let's have slide 32, please.

20 What products did you consider for your
21 infringement opinions?

22 A. So for the decoding claims, I considered a
23 variety of accused products. For HP, these are laptop and
24 desktop computers. For Amazon, these are Fire Tablets,
25 Smart TVs, and streaming devices, and use various hardware

1 chipsets from AMD, Intel, NVIDIA, Qualcomm, MediaTek,
2 Amlogic and for encoding I considered HP laptop and desktop
3 computers with various hardware options.

4 Q. What products did you consider for your domestic
5 industry opinions?

6 A. Let's move to slide 33.

7 For Microsoft, I considered Surface computers, as
8 well as Xbox Series X/S. And for Samsung, I considered the
9 Galaxy generation from S20 to the current S24, again, with
10 various hardware options.

11 Yes, and for encoding, I considered Microsoft
12 Surface computers with Intel and NVIDIA hardware.

13 Q. Can you describe your methodology that you
14 undertook before you formed your opinions?

15 A. Yes. Let's go to slide 34.

16 So for providing the coding evidence, I relied on
17 the H.265 standards. On the AV1 specification that's also
18 important, I played back video and analyzed that video and
19 also inspected the source code. I traveled to locations in
20 Northern, Southern California as well as Texas and Alabama
21 to inspect source code on the computers that were provided.

22 For encoding, I looked at video bitstreams that
23 are H.265 compliant. I also did testing analyses on video
24 encoders, also inspected source code. And also considered
25 various documents including, of course, the '267 patents and

1 others.

2 Q. And I notice here on slide 34 you have encoding
3 and decoding evidence listed separately. Why is that?

4 A. Well, the encoding claims and decoding claims.
5 And so, for instance, Amazon does not have encoding devices.

6 Q. Let's go to slide 35, please.

7 What does the H.265 standard have to say about
8 encoding versus decoding?

9 A. Yeah. So H.265 is a standard for the video
10 bitstream and for the decoder. It is not an encoding
11 standard. And so that's the official document describing
12 the H.265 standard.

13 Q. Looking at slide 35 here, can encoding claims be
14 required by the H.265 standard?

15 A. No. Well, can you repeat the question?

16 Q. Can encoding claims be required by the H.265
17 standard?

18 A. So, again, the H.265 standard is not an encoding
19 standard.

20 Q. Let's go to slide 36.

21 Does AV1 treat encoding versus decoding in the
22 same way as H.265?

23 A. So AV1 is similar to H.265, a standard for the
24 bitstream and for the decoder but not one for the encoder.

25 Q. Slide 37, please.

1 MR. VERBONCOEUR: Your Honor, at this time, we
2 need to go on the Respondents' confidential record.

3 JUDGE ELLIOT: Very well.

4 (Whereupon, the hearing proceeded in confidential
5 session.)

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 BY MR. VERBONCOEUR:

3 Q. Professor, you mentioned testing analyses
4 earlier. Can you explain what you did?

5 A. Yes. So for decoding, so we used video from a
6 variety sources, including Amazon, HP testing and websites.
7 We also recorded video with the encoding products and we
8 used publicly-available video.

9 We also use a tool called VQ Analyzer that is a
10 common tool to analyze statistics and data that are -- that
11 are useful for analyzing video. And we also were able to
12 play back video that was H.265 and AV1-compliant on the
13 accused products. And also we verified that hardware
14 accelerated decoding was used. That is for decoding.

15 And for encoding on the right side we encoded
16 video using this hardware accelerated encoding on the
17 accused products. We verified that the bitstreams are H.265
18 or AV1-compliant when applicable. And we verified that
19 there are, indeed, encoded using the accused products.

20 And so, again, we used a VQ Analyzer to analyze
21 the encoded bitstreams.

22 Q. You also mentioned source code analyses earlier.
23 How did you analyze the source code?

24 A. Let's move to slide 41.

25 So as I mentioned, I visited the review computers

1 for all the source code I analyzed. I reviewed the source
2 code for both patents, '267 and the '714. There were
3 multiple versions of the source code, but it was
4 substantially similar among -- across various versions of
5 the code.

6 And I confirmed that the logic that we were
7 interested in bi-prediction for '267 and what is called a
8 merge mode for '714 was indeed present in both the accused
9 and the domestic industry products.

10 Q. Can we please have slide 42.

11 Did you group the accused and domestic industry
12 products for purposes of your sources of proof?

13 A. Yes. So for, for instance, decoding, you can
14 look at the H.265 standard and the AV1 specification. I
15 considered representative products. And for playback
16 testing analyses, I also considered a large number of
17 representative products.

18 And for the source code, as I mentioned, I
19 observed no material difference across the different
20 versions of the code. For encoding, likewise, I considered
21 the representative products and for the source code, again,
22 no material difference between the different versions.

23 Q. Can we please have slide 43.

24 And we need to briefly go back on the HP
25 confidential record.

1 JUDGE ELLIOT: Very well.

2 (Whereupon, the hearing proceeded in confidential
3 session.)

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 BY MR. VERBONCOEUR:

3 Q. How did you decide on which Amazon representative
4 products to test?

5 A. Yeah. There is no stipulation agreed upon for
6 representative products, so we tested ten representative
7 Amazon devices, including TVs, streaming devices, and
8 tablets.

9 Q. How did you decide on representative domestic
10 industry products?

11 A. Let's move to slide 46.

12 There, as mentioned, I tested five Samsung Galaxy
13 phones, S20 through S24. And also four Microsoft products,
14 an Xbox, and Surface computers configured with Intel, AMD,
15 and NVIDIA hardware.

16 Q. Turn to your infringement analyses now.

17 A. Yes.

18 Q. And would it be okay with you if we discussed
19 your infringement and technical domestic industry opinions
20 together?

21 A. Yes.

22 Q. Let's have slide 47, please.

23 How did you organize your technical analyses?

24 A. So the coding claim 25, this first preamble, and
25 then there is first elements 25a through 25g, which I will

Heritage Reporting Corporation
(202) 628-4888

1 cover in the next slide, and then the dependent claims 26
2 and 27.

3 Q. And I see we just turned to slide 48, where the
4 preamble of claim 25 is displayed. What evidence do you
5 have that the preamble of claim 25?

6 A. Yes. So this is an apparatus claim. So the
7 preamble specifies an apparatus for decoding a block of
8 pixels, actually comprising several components. And here I
9 use the H.265 standards.

10 Q. Let's turn to the next element. What evidence do
11 you have for claim 25a?

12 A. Yeah. Let's look at slide 49.

13 So 25a lists at least one processor and one
14 memory, including computer program code, causing the
15 apparatus to take a number of actions. So the existence of
16 such processor and memory, including computer program code,
17 was admitted by both HP and Amazon in the RFA responses.

18 And also it was confirmed by my review of the
19 source code, including software and the RTL codes.

20 Q. Let's turn to the next element. What evidence do
21 you have for 25b?

22 A. Yeah. Let's move to slide 50.

23 So this one becomes technical. So here I have
24 highlighted in different colors the relevant portions of
25 that element. So we need to determine for a current block,

1 a first reference block based on the first motion vector, as
2 well as a second reference block based on the second motion
3 vector.

4 So from the H.265 standards, the section
5 concerned with bi-prediction, what is called the
6 bi-predictive slice. And we see that all of these notions
7 are reflected. So in purple we see the decoding process for
8 the prediction unit. That is the current data to be
9 encoded. And then in yellow, we see this mvL0 and mvCL0.
10 So these specify the motion vectors for the first reference
11 block.

12 And then in green we see a second motion vector.
13 That is mvL1 and mvCL1. So that is a motion vector for the
14 second reference block.

15 And then in orange we see the indices for these
16 two reference blocks. They are called refidxL0 and
17 refidxL1. So they correspond to each other.

18 Q. I have a question about slide 50, Professor.

19 You mentioned mvL0 and mvCL0. What is the
20 difference between those?

21 A. Sorry, so say again?

22 Q. There is mvL0 in yellow on slide 50 and there is
23 mvCL0.

24 A. Yes. Yes. Good question. So L0 stands for list
25 0. So mv is just the motion vector for the luma component.

1 mvC, the C stands for chroma. So there is a motion vector,
2 you apply to luma blocks and a corresponding motion vector
3 for chroma blocks.

4 Q. I see here on slide 50 that part of the claim
5 element that involves a first precision is not highlighted.
6 Do you have any evidence for that part of claim 25?

7 A. Yes. Let's move to slide 51.

8 So this element of the claim recites -- so,
9 again, the input pixels have a first precision. And so the
10 pixels are the current block to be encoded. The first
11 reference block and the second reference block have values
12 with a first precision.

13 So in the H.265 standard, so we see that the
14 verbal is called BitDepth_y and BitDepth_c highlighted in
15 yellow. These equations, 7-4 and 7-6. So those represent
16 the bit depth or equivalently the precision for all three.

17 And there is quantity called
18 bit_depth_luma_minus8, which is just another way of
19 representing depth precision.

20 Q. Why is it on slide 51 these parameters you're
21 pointing to are called minus 8?

22 A. It is just scaling the range. Because it is
23 equal to bit depth minus 8.

24 Q. So if you had a value of 2, what would your bit
25 depth be for bit depth minus 8?

1 A. If bit_depth_luma_minus8 was equal to 2, then the
2 bit depth would be 10.

3 Q. Let's turn to the next element. What evidence do
4 you have for claim 25C?

5 A. Let's move to slide 52.

6 So I am considering elements C and D together
7 here for illustration. 25c says use the first reference
8 block is highlighted in green to obtain a first precision
9 highlighted in yellow. Said first prediction having a
10 second prediction, which is higher than the first
11 prediction. So I am illustrating the green and yellow parts
12 on this slide.

13 We see on the left this is actually the same
14 diagram I showed earlier, light blue, the existing pixels in
15 the reference picture. And so we consider a reference block
16 and we need to obtain a first prediction.

17 So, for instance, so b0,0 here is a pixel value,
18 a new pixel value, j0,0 is a new pixel value. And, again,
19 highlighted in green we see on the left side from the H.265
20 standard, this is called the luma reference sample array,
21 refPicLX1. And there is likewise on the right side, they
22 are the same concept for chroma, with just a different name.

23 And so the prediction, the first and second
24 prediction are indicated in yellow. And the notation in the
25 H.265 standard is predSampleLX1. The second "L" stands for

1 luma. And then on the right with predSampleLXc, and that
2 "c" stands for chroma.

3 Q. I'm looking here at slide 52 and I see that part
4 of claims 25c and 25d are not highlighted that involve the
5 first and second predictions having a second precision.

6 Do you have any evidence for that part of the
7 claim?

8 A. Yeah. Let's move to 53.

9 That is a crucial part of the patent. First
10 precision will have a second precision, which is higher than
11 the first precision.

12 Now let's look at the H.265 standards. And let's
13 look at the first equation highlighted in yellow, this
14 equation 8-227.

15 And the capital letters A-3,0, A-2,0, all these
16 variables. There are eight of them. These are input pixels
17 which are the first precision. And you see that they need
18 to be combined through the application of the P-tap filter.
19 Here P is equal to 8. And they are going to be multiplied
20 by numbers like minus 1, plus 4, minus 11, plus 40, and so
21 on.

22 And so the result of that operation then will be
23 shifted to the right by a quality called shift1. And at the
24 bottom here of the H.265 standard slide I am showing, shift1
25 has a certain value in the standard.

1 If you apply that formula to our example, if the
2 input bit depth was 10, that's highlighted by the red box
3 there, if you do the calculation in this case shift1 is
4 equal to 2, we use an 8-tap filter in the equation 8-227, so
5 these ways all sum to 64, which is 2 to the power of 6. So
6 this operation, this multiplication, addition adds basically
7 6 bits. You need 6 bits to maintain the original precision.
8 Otherwise you need to introduce rounding and truncation and
9 errors.

10 This $b_{0,0}$ will have a bit depth equal to 10, plus
11 6 minus 2. That's equal to 14.

12 Q. I see here on slide 53 this is labeled example 1
13 but I recall you gave us two examples of sub-pixels on slide
14 52. Do you have another -- do you have an illustration for
15 example Number 2?

16 A. Yeah. Let's move to slide 54. So here this is
17 another sub-pixel called $j_{0,0}$. There is a similar, you
18 know, equation, 8-236 in the standard. So here the weighted
19 sum is shifted to the right by shift2 and here shift2 is
20 equal to 6. If we look at bit depth, 10 being the first
21 precision, that will obtain 14 as the second precision as
22 highlighted in the red box.

23 So that's a derivation -- yes. So this kind of
24 duration is done both for luma and chroma.

25 Q. Let's turn to the next element. What evidence do

1 you have for claim 25e?

2 A. Let's move to slide 55.

3 So there, again, there is a crucial part of the
4 patent, obtain a combined prediction based at least partly
5 upon the first prediction and the second prediction, which I
6 discussed. So if we look at the H.265 standards, this first
7 prediction highlighted in yellow is identified with
8 predSampleL0, likely zero.

9 The second prediction, green, is identified with
10 predSamplesL1, like the second list. And you observe that
11 these two predictions are added together. And then an
12 operation is applied. And then highlighted in turquoise with
13 a right shift by shift2.

14 Now, that's element 25f, decrease precision of
15 said combined prediction by shifting bits to the right. So
16 the shift2 is number of bits by which we're shifting to the
17 right and shifting to the right introduces a reduction in
18 precision. So that was called the default weighting
19 process. And you observe that there the two predictions
20 receive the same weight. They were just added together.

21 There is a similar formula, which is more
22 general, it is 8-279, where the main difference if you look
23 at it is that each prediction in yellow and green is
24 multiplied by a weight, w_0 and w_1 . And so this allows
25 giving a high weight to one of the references, one of the

1 predictions.

2 Q. Let's turn to the next element. What evidence do
3 you have for claim 25g?

4 A. Let's move to slide 56. So 25g is about
5 reconstructing the block of pixels based on the combined
6 prediction. So in the H.265 standard, we see in yellow,
7 predSample, as I mentioned, is a combined prediction. This
8 is an array describing the block. And then in green we see
9 equation 8-327 in the H.265 standard, so on the left side we
10 have recSample. That is the reconstruction. And it is
11 obtained by applying a formula to the prediction and also
12 adding residuals.

13 Q. Does the H.265 standard in your opinion require
14 claim 25 for decoders?

15 A. Yes, it does.

16 Q. Actually I realize I may not have asked you about
17 something. I would like to go back, please, to slide 53.

18 A. Yes.

19 Q. This is one of the examples you gave us, I
20 believe, of sub-pixel interpolation you said.

21 It says here on the left-hand side of this slide
22 by applying an 8-tap filter. What is an 8-tap filter?

23 A. Look at this equation, 8-227 that I discussed.
24 So the inputs was this capital letters A-3,0, A-2,0, so
25 there are actually eight inputs total, eight samples. And

1 each of them is multiplied by a weight, like minus 1, plus
2 4, minus 11. And so that is an 8-tap filter. It's called
3 sometimes a linear filter of finite length. It's simply a
4 blank multiplications, additions to P input samples.

5 Q. And you opined earlier that this 8-tap filter in
6 this example adds 6 bits. Can you explain the mathematical
7 correlation between the 8-tap filter and that opinion of
8 yours?

9 A. And what, sorry?

10 Q. The opinion that the 8-tap filter adds 6 bits. I
11 am looking for, how do we know that?

12 A. Well, this is what the standard selected. So
13 this is a fixed 8-tap filter from the standards.

14 Q. For a layperson like me, how do I know that an
15 8-tap filter adds 6 bits?

16 A. That adds 6 bits?

17 Q. Yeah. You told us the 8-tap filter in this case
18 adds 6 bits. How do you know that?

19 A. No, okay. So what I said is -- I see what you
20 mean on the right side. So if you, again, look at the input
21 precision, which in my example was 10. If you apply all of
22 these operations and you want to preserve the precision of
23 the results, you are going to have a total of 16 bits.

24 So that is because all these coefficients minus
25 1, plus 4, minus 11, 40 and so on, they all sum to 64, which

1 is two to the power of 6.

2 So if you do a simple calculation, you see that
3 if you start from 10 bits, if you don't want to lose any
4 precision, you need 16 bits.

5 Q. Can we move on to the dependent claims now?

6 A. Yes.

7 Q. Let's have slide 57, please.

8 Professor, what evidence do you have for claim
9 26?

10 A. Yeah, so 26 is about the case where the motion
11 vector points to a sub-pixel as I mentioned, such as
12 half-pixel or quarter-pixel accuracy. And so that is
13 reflected in the standard, H.265. Again, on the left side
14 we see a sample like b0,0 that is a luma sample there.

15 If you look at, again, the equation 8-227, we see
16 that equation I mentioned, so that is the case where we have
17 a motion vector pointing to a sub-pixel.

18 Q. What evidence do you have for claim 27?

19 A. Yeah. So for 27 the concept there is right
20 shifted is highlighted in green. It's taking that first
21 prediction and then right shifting a sum of a P-tap filter.
22 That is captured in the equation 8.227 by this shift to the
23 right. So that is going to be a reduction in precision.

24 Q. I believe, Professor, earlier you told us that
25 you had two examples of sub-pixels from the figure that is

1 on the left-hand side of slide 57. Do your opinions apply
2 to all of those sub-pixel locations?

3 A. Yes.

4 Q. And that's true for all of the decoding claims of
5 the '267 patent?

6 A. Yes.

7 Q. In your opinion, Professor, does the H.265
8 standard require claims 26 and 27 for decoders?

9 A. Yes, it does.

10 Q. We have been discussing H.265. Earlier you
11 mentioned having opinions relating to both H.265 and AV1.
12 Do you have any evidence that you are prepared to present
13 relating to AV1?

14 A. Yes. Let's move to slide 58. So there is an AV1
15 specification, again, for the bitstream and the decoder, not
16 for the encoder, and so I am going to be relying on this.
17 Yes.

18 Q. So let's turn to the next element. What evidence
19 do you have for claim 25a?

20 A. Let's move to slide 59.

21 Again, the existence of the processor and the
22 memory, including computer program code as being admitted
23 both by HP and by Amazon. And for AV1, I confirmed it was
24 the case by my review of the source code.

25 Q. Do you have any other evidence for claim 25b?

1 A. Yes.

2 Q. I skipped a slide. I apologize.

3 Let's turn to the next element. What evidence do
4 you have for claim 25b?

5 A. Yeah. Let's move to slide 60.

6 So for 25b, so going back to a first reference
7 block and the second reference block based respectively on
8 the first motion vector and the second motion vector, so
9 this is captured in the AV1 specification. It's called
10 compound prediction in AV1 language, not by a prediction.

11 And so as explained there, it combines blending
12 together two predictions. And, again, the motion vector is
13 used for prediction. So that language is captured in the
14 AV1 specification.

15 Q. Is compound prediction in AV1 substantially the
16 same thing as bi-prediction in --

17 A. It is just another name.

18 Q. Do you have any other evidence that relates to
19 claim 25b?

20 A. Yes. Move to slide 61.

21 So there we need to identify as I highlight in
22 green a first reference block and a second reference block
23 based on the first motion vector and the second motion
24 vector. So in the AV1 specification, we see regarding the
25 current block highlighted in purple, there is a title of the

1 Section 7.11.3.4, so that is the process for doing
2 inter-frame prediction for the current block.

3 And then in green we see the variables that
4 describe the block, refidx, also the location with certain
5 units and then the width and the height of the block. So
6 that's in that section.

7 And regarding the motion vector, we see on the
8 left side, this is Item Number 8, the motion vector array is
9 called mv.

10 Q. I see that part of claim element 25b on your
11 slide 61 is not highlighted. Do you have evidence for that
12 part of claim 25?

13 A. Yes. Let's move to slide 62.

14 So this is about precision. So the pixels in the
15 current block, the first reference block and the second
16 reference block have values for the first precision. And in
17 the AV1 specification, we see, indeed, that the selected
18 reference frames, both of them must match the current frame
19 in bit depth. So it does the same first precision.

20 Q. Let's turn to the next element. What evidence do
21 you have for claim 25c?

22 A. Let's move to 63.

23 So there it's about, again, I am grouping 25c and
24 25d. So obtain -- use the first reference block to obtain a
25 first prediction. And then for 25d use the second reference

1 block to obtain a second prediction.

2 And if we look at the AV1 specification, if we
3 look at the green highlighted equation there, so that's the
4 equation that provides a reference block, it's called ref.
5 And it is obtained through this interpolation process I
6 mentioned earlier, so the interpolation actually is two
7 stages. You first do filtering in the horizontal direction
8 and then you do filtering in the vertical direction.

9 So in the first stage, it's called stage 1 of 2,
10 that is horizontal filtering. And the filter coefficients
11 can be found from this table at the center of my slide.

12 So, for instance, if we look at any row, let's
13 say a row in the center, we see a number of values there,
14 such as 0, 2, -14 and so on. And so no matter which we're
15 looking at, these will sum to 128, which is 2 to the power
16 of 7. So if we by the same reasoning we applied earlier
17 with the 8-tap filter, we get an increasing bit depth of 7.
18 It was 6 previously.

19 Then regarding the second precision, this 1, 2,
20 which is a running operation, is going to be applied.

21 Q. Professor, before you continue there, I want to
22 ask you something about slide 63.

23 These filter weights as you described them from
24 the AV1 specification, are these applied to different pixel
25 locations in the same way that you described for H.265?

1 A. Yes. The same concept, just different filters.

2 Q. I also see that you just mentioned round2 and you
3 have that bolded here on slide 63. Can you explain how that
4 works?

5 A. Yeah. Let's move to slide 64.

6 So we, again, look at this on the left side, the
7 same green highlighted equation. And under that equation,
8 the realized equation, you see the result of this first
9 stage called intermediate. So it's obtained by applying
10 this round2 function with a certain parameter called in this
11 case interRound0, which is equal to 3 in this case.

12 So, round -- this is basically a rounding
13 operation. And so if we apply this to our example, so
14 InterRound0, if you go to 3, as I mentioned. So if we take
15 as an example the first precision being 10, we're going to
16 have at this stage after all it includes filtering, a bit
17 depth of 10 plus 7, for 17. And then this basically
18 rounding introduces a right shift by 3. This is going to be
19 reducing the precision to 14, down from 17.

20 Q. I see here, Professor, you have described this
21 block prediction as a two-stage process. Can you tell us
22 about the second stage?

23 A. Yeah. Let's move to 65.

24 So the second stage is quite similar. So it's
25 vertical filtering. This is the yellow highlighted

1 equation. So, again, this is the prediction equation at the
2 bottom. So the same idea except in this case the InterRound
3 verbal is InterRound1. And the value of it depends, are you
4 doing bi-prediction or not?

5 So if we're doing bi-prediction or not, there is
6 a different value, either 7 or 11. So going back to my
7 example, if the input depth is 10, in this case the final
8 bit precision is going to be 21 minus 7, because InterRound1
9 is equal to 7, since you're adding bi-prediction. So the
10 final second precision is going to be 14, which is higher
11 than the first precision, which was only 10.

12 Q. Just so it's clear, your opinions that you have
13 expressed with reference to slide 65, those apply to both
14 claim 25c and 25d?

15 A. Yes.

16 Q. Can we turn to the next element. What evidence
17 do you have for claim 25e?

18 A. Let's move to 66.

19 So there it's about -- I am combining 25e and f
20 together. So it's about obtaining a combined prediction
21 based at least partly upon the first prediction in yellow
22 and the second prediction in green. And we see that if you
23 look at the right side from the AV1 specification, we see in
24 yellow preds0 and preds1. So these are the first and second
25 prediction.

1 And, again, just like it was with H.265 that
2 combined through a formula for script 1. So this would be
3 the case where the weights given to both predictions are the
4 same, and then there is a different equation if the weights
5 are unequal.

6 And you can see the details of this round2
7 operation I mentioned there. It takes the argument, the
8 first argument is X and the second argument is N. So if the
9 simplest way to think of that initially is to take N equal
10 to 1.

11 So this would do X plus 1 over 2, so basically
12 it's dividing by 2. And the plus 1 in the numerator is
13 snuff sense. So if N is not equal to 1 but a larger number,
14 then, again, you have a rounding operation but also a
15 division. So you are doing equivalently binary arithmetic,
16 you are adding a right shift. That's the equivalent.

17 Q. And --

18 A. So that's captured -- I'm sorry -- in the very
19 last equation, okay. One way to implement that division and
20 rounding is showing the last equation. You take X, the
21 input, you add 1. And then you're going to right shift by
22 N. So 1 was left shifted by 1, minus 1, so that implements
23 the equation shown above.

24 Q. Professor, just so it's clear, the opinions
25 you're expressing with respect to slide 66 apply to both 25e

1 and 25f?

2 A. That's correct.

3 Q. And you explained how round2 works and that to
4 the end. What are those carets you have highlighted in
5 purple here on slide 66?

6 A. This is a right shift. Again, as is well-known,
7 if you take inventor arithmetic if you have a binary
8 representation of an integer and you right shift it, you're
9 losing the bits you have shifted. So if I shift right by
10 one bit, I am losing the last bit.

11 So that's a way to do division by 2. And of
12 course it loses precision. So if I started from, say -- so
13 if I have either 2 or 3, I divide them by 2, and I round I
14 am going to get 1. I am going to get 1 in each case so I
15 have lost precision?

16 Q. There is also in this round2 equation in the
17 middle of slide 66, there is, it says 2 to the N minus 1.
18 What is that?

19 A. This would be enough said. Again, the simplest
20 way to understand, this is 1, N is zero. So we have in this
21 case X plus 1 over 2. And then you take -- you apply the
22 full function of that. So, again, if X is equal to 2, we're
23 going to do 2 plus 1 over 2. And so taking the flow of that
24 one, you need to get 1.

25 So it allows you to -- yeah, to do rounding. If

1 you didn't have it, you would be rounding down instead of
2 rounding up.

3 Q. Let's turn to the next element. What evidence do
4 you have for claim 25g?

5 A. Let's move to 67.

6 So now the block of pixel should be reconstructed
7 based on the combined prediction. So in AV1 terminology,
8 the reconstruction would be called CurrFrame highlighted in
9 green. And then the combined prediction was highlighted in
10 yellow. And the relation between the two is, again, a
11 function so that is how you would construct based on the
12 combined prediction.

13 Q. I see here on slide 67 there is something called
14 residual. I believe you mentioned that concept earlier.
15 Can you remind us what that is?

16 A. Yes. So the combined prediction is in yellow.
17 But the reconstruction really is to combine the prediction
18 with the prediction error. So in this case, they are simply
19 added together. On the left side, the yellow combined
20 prediction, you add the residual error. So that is the
21 final reconstruction.

22 Q. Slide 67, I also see something called clip. What
23 is that?

24 A. So Clip is called clipping function. So the idea
25 is that because of these filtering operation, the filter

1 sometimes have negative weight. You might end up with a
2 negative pixel value at the end, which is not allowed.

3 So in this case you set that number to zero. And
4 likewise, it could be happened at the upper end of the
5 range. Like if you have 10 bits, the maximum value, pixel
6 value alone is 1,023. Due to filtering operations, you
7 could end up with a value larger than 1,023. And then to be
8 clipped to 1,023. So it fits in the yellowed range.

9 Q. Does the AV1 specification require claim 25 for
10 decoders?

11 A. Yes.

12 Q. Can we turn to the dependent claims now.

13 A. Yes.

14 Q. Let's have slide 68, please.

15 What evidence do you have for claims 26 and 27
16 from the AV1 specification?

17 A. Yes. So I am grouping, again, 26 and 27
18 together. So this is the case where the first motion vector
19 points to a sub-pixel. And so in AV1 language we see, so
20 this is the purple equation. So we see sub-filter both on
21 the left and on the right side. So these are the filters
22 that are used in case the motion vector points to a
23 sub-pixel.

24 Regarding claim 27, regarding the right shift, so
25 this is the green highlight, so we see that is also

1 reflected in the AV1 specification. So at the very bottom
2 we set pred equal to round2, which I just discussed of S,
3 into round1. So that is going to be -- as explained
4 earlier, obtain the prediction by shifting the output of the
5 filter to the right.

6 Q. Professor, in your opinion, does the AV1
7 specification require claims 26 and 27 for decoders?

8 A. Yes, it does.

9 Q. And you mentioned something called pred earlier.
10 Would a person of skill in the art understand that to be
11 shorthand for prediction?

12 A. Yes.

13 Q. Do you have evidence other than the H.265
14 standard and AV1 specification for claims 25, 26, and 27 of
15 the '267 patent?

16 A. Yeah. Let's move to slide 69.

17 So as I mentioned, the videos I tested, they all
18 include -- they include H.265-compliant bitstreams. That is
19 something you can see in the Task Manager there. It shows
20 that the video is in the HEVC format, which is the same as
21 H.265.

22 Q. Now, we talked a lot about the bi-prediction
23 processes and AV1 and H.265. How do you know if what you
24 tested has anything to do with that bi-prediction process?

25 A. Well, let's move to slide 70.

1 So when you have a video, you can apply these two
2 as I mentioned the VQ Analyzer tool. And so here I'm
3 showing on the left a portion of an image. And you can look
4 at various levels of detail. So you could focus on the
5 block like the one highlighted in orange at the center of
6 the picture.

7 And then it is a little bit hard to read from a
8 distance, but you can see the type of prediction that is
9 used. So, for instance, you can see the slice type. And
10 then it's really written very small for me to read, but you
11 see there are two motion vectors there on the left side in
12 this box equation, so if I get two motion vectors, this is
13 what is used in bi-prediction.

14 So all these data on the left side gives you
15 quantities pertaining to bi-prediction. So that's how you
16 know bi-prediction was used, what motion vectors were used,
17 et cetera.

18 Q. Did you play back these bitstreams on products at
19 issue in this case?

20 A. Yes.

21 Q. Let's have slide 71, please.

22 Are you providing us with an illustration on
23 slide 71 of some of this playback testing you did?

24 A. Yes. This was playing back on Amazon Fire Max 11
25 and HP Spectre and then for the domestic industry on the

1 Samsung Galaxy S24 and on the Xbox Series X.

2 Q. Did any of your testing relate to AV1?

3 A. Yes.

4 Q. Let's have slide 72, please.

5 Can you tell us how you knew that?

6 A. Same process. If you have a video, the Task
7 Manager here will tell you it's in the AV1 format, so as we
8 see from that box here.

9 Q. How do you know if the testing that you undertook
10 for AV1-compliant bitstreams related to the compound
11 prediction processes you were talking about earlier?

12 A. Yes. So moving to 73, it is the same process.
13 So you use the VQ Analyzer, for instance, to analyze the
14 data. So from this picture, we can focus on the block.
15 That is one highlighted in orange.

16 And then on the left side, you know, the bottom
17 left, we see all these tiny numbers that are hard to read.
18 Again, there are two motion vectors and various quantities
19 that describe the details of this bi-prediction.

20 Q. Slide 74, please.

21 Professor, what products did you perform this AV1
22 playback testing on?

23 A. Yeah. I used the Amazon Fire Stick 4K Max and an
24 HP Spectre.

25 Q. And do the exhibits listed on slide 74 provide

1 additional testing results from your analysis?

2 A. Say again? Sorry.

3 Q. Do the exhibits that are listed here on slide 74
4 provide additional testing results from your analysis?

5 A. Yes.

6 Q. Let's have slide 75, please.

7 Your Honor, at this time we need to go on the
8 third-party confidential record.

9 JUDGE ELLIOT: Very well.

10 (Whereupon, the hearing proceeded in confidential
11 session.)

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1 A F T E R N O O N S E S S I O N

2 (1:30 p.m.)

3 JUDGE ELLIOT: Have a seat. All right. Go
4 ahead.

5 MR. VERBONCOEUR: Can we have -- for everyone in
6 the room, we are still on the third-party confidential
7 record.

8 JUDGE ELLIOT: Yes. Okay. That's what we were
9 on when we broke for lunch. Very good.

10 BY MR. VERBONCOEUR:

11 Q. Welcome back, Professor.

12 A. Thank you.

13 MR. VERBONCOEUR: Your Honor, may I proceed?

14 JUDGE ELLIOT: Yes.

15 BY MR. VERBONCOEUR:

16 Q. Can we have slide 76, please.

17 Did you review any other evidence for the
18 decoding claims of the '267 patent beyond the H.265 standard
19 AV1 specification in your testing analyses?

20 A. Yes. I reviewed, as I mentioned earlier, the
21 source code for the accused products, so I considered a
22 variety of products, HP and Microsoft. And I examined the
23 source code. So as I said, I traveled to different
24 location. I examined the source code.

25 On the right side under the relevant files, you

1 see some names of some of the files that I have inspected.
2 So some do H.265 decoding, some do AV1 decoding, and some do
3 related functions.

4 Q. And I believe, Professor, you just mentioned that
5 you reviewed HP -- well, source code that would be relevant
6 to HP computers and Microsoft devices. Did you also review
7 code that would be relevant to Amazon devices?

8 A. Yes. So I listed under relevant products. You
9 see that, for instance, Amazon tablets, streaming devices,
10 laptops. Also, I want to emphasize the source code I looked
11 at is both software and RTL code.

12 Q. What did you find when you reviewed the source
13 code that you're showing here on slide 76?

14 A. Yes. I found that these devices infringe on the
15 '267 patent.

16 Q. Did the source code that you reviewed perform the
17 same functionality as you were describing in your analyses
18 of the AV1 specification and H.265 standard earlier?

19 A. Yes, they did.

20 Q. Let's have slide 77, please.

21 Professor, how do you know that the source code
22 you reviewed is actually on the products at issue in this
23 case?

24 A. So we got various confirmations that -- well, can
25 you rephrase your question? Sorry.

1 Q. How do you know that the source code you reviewed
2 at the source code computers you traveled to is actually on
3 the accused products at issue in this case?

4 A. Well, so I inspected the source code and I found
5 it is on the devices.

6 Q. If someone challenged you, Professor, and they
7 said, well, how do you know that the code you reviewed is
8 actually relevant to the real-life products, how do you know
9 that those two map up?

10 A. That the code relies -- is on the products?

11 Q. Yes.

12 A. Yeah. So, you know, we have various
13 confirmations that this is the case indeed.

14 Q. Are you showing those confirmations that the
15 source code is, in fact, authentic and on the products here
16 on slide 77?

17 A. Slide 77, yes.

18 Q. Okay. Can we turn to the encoding claims of the
19 '267 patent now.

20 A. Yeah. That would be on my next slide, 78.

21 Q. We can go on the public record at this time.

22 JUDGE ELLIOT: Very well.

23 (Whereupon, the hearing resumed in open session.)

24

25

1 O P E N S E S S I O N

2 BY MR. VERBONCOEUR:

3 Q. Professor, what evidence do you have for claim 7
4 preamble of the '267 patent?

5 A. That -- I guess move to the next slide, 79. So
6 79 -- claim 7 is an apparatus claim for the preamble, using
7 an apparatus for encoding a block of pixels, the apparatus
8 comprising a certain number of things, which are listed in
9 7a, at least one processor and at least one memory including
10 computer program code, et cetera.

11 And so the existence of such processor and memory
12 was admitted by HP in the RFA responses. And it was, again,
13 confirmed by my review of the source code.

14 Q. I notice, for the record, that on slide 79 and
15 your testimony just now you grouped 7preamble and 7a
16 together.

17 A. Yes.

18 Q. What evidence do you have for claim 7b?

19 A. 7b, let's move to slide 80. So 7b is to
20 determine for a current block, highlighted in purple, a
21 first reference block based on a first motion vector, in
22 yellow, and a second reference block based on a second
23 motion vector, highlighted in green, and where the pixels of
24 the current block, the first reference block, and the second
25 reference blocks have values with the same, a first

1 precision.

2 So this is a VQ Analyzer screenshot for one
3 typical video. And so, again, focusing on the particular
4 block, there's one highlighted in purple. That's the
5 current block to be encoded. On the left side of the VQ
6 Analyzer screenshot are shown several quantities pertaining
7 to the block, including two motion vectors. There's a first
8 motion vector and a second motion vector.

9 And on the right side you can see mvL0 and mvL1.
10 So these are the values of these two motion vectors. One is
11 84 and 8 as a coordinate, and the other is minus 79 and
12 minus 4.

13 Q. And, Professor, I want to ask you about something
14 on slide 80. There is something that says bit depth Y,C.
15 What is that?

16 A. Bit depth Y,C, that is the bit depth of the
17 inputs, okay? So in this case, again, it's the current
18 block, the first reference block, and the second reference
19 block. So all the video has bit depth 10, which is a
20 typical value, both for chroma Y -- sorry, chroma C and luma
21 Y.

22 Q. Are you pointing to that bit depth 10,10 as a
23 first precision here on slide 80?

24 A. So the first time is a precision for Y and the
25 second time is a precision for chroma. And that's the first

1 precision.

2 Q. What is the range, the value range for 10 bits?

3 A. So that would be all integers, 01 through 1023.

4 Q. How would you figure that out?

5 A. I've done that since I was a kid.

6 Q. Well, for a layperson like me who is not really
7 familiar with binary math, how would you explain to somebody
8 how you come up with zero to 1023?

9 A. Okay. So if you have a single bit, we can
10 represent either 0 or 1. If we want to represent a value 0,
11 1, 2, and 3, we do that using two bits. So there's four
12 possible combinations of 0 and 1. So, for number 3, which I
13 mentioned earlier, is 1-0 in binary format. So 1 multiplies
14 two to the power of 1, zero multiplies 2 to power 0, and so
15 the sum is equal to 2.

16 So any integer can be expanded in binary form,
17 and so a bit corresponds to two possible values, two bits
18 correspond to four values, three bits correspond to eight
19 values. And if you do the math, ten bits corresponds to
20 1,024 values.

21 Q. I notice here on slide 80 that you don't have a
22 first reference block and a second reference block
23 highlighted. Do you have evidence for those aspects of the
24 claims?

25 A. Yeah, because -- so this here was encoded video,

1 H.265, right? So this is the motion vectors, the two motion
2 vectors corresponding to two reference frames. So they are
3 reference frames. We can even see them on the top. It's a
4 bit hard to see unless we manage to zoom in.

5 Q. And, Professor, maybe I can short-circuit this if
6 you go to slide 81. Do you have a depiction of the
7 reference pictures you just referred to for us?

8 A. Yeah. That will be a bit more clear. We can
9 leave it like this. Okay.

10 The purple one is the current block. If you look
11 at the sequence of images at the top of the VQ Analyzer
12 screenshot, then we see two pictures highlighted in yellow
13 and green. So these are the first and the second reference
14 pictures. And so those first and second reference blocks
15 come from those two pictures, respectively.

16 Then on the right side, on the screenshot on the
17 right side, we see an array of values. So this is 8-by-8
18 array. And so these show the values of the pixels in an
19 8-by-8 block. So highlighted in yellow, that would be for
20 the first reference frame, and highlighted in green for the
21 second one.

22 And on the left side highlighted in purple, that
23 would be corresponding numbers for the current frame. So
24 with the VQ Analyzer, we can easily visualize and see all of
25 these numbers.

1 Q. What evidence do you have for claim 7c?

2 A. Let's move to slide 82. So slide 82, so I
3 combine here 7c and 7d together. So this is using the first
4 reference block, highlighted in yellow. And, again, I'm
5 showing the same array that I showed in the previous slide.
6 And the second reference block mentions 7d, highlighted in
7 green.

8 So 7c, you use the first reference block to
9 obtain a first prediction, and that first prediction has a
10 second precision, which is higher than the first. So let's
11 look at the block that's highlighted in yellow on the left
12 side. And so we look at a particular pixel. Maybe we want
13 to zoom in a little bit on the lower left part of this
14 picture so we see numbers more clearly.

15 Q. Mr. Moreno, are you able to zoom in there? Lower
16 left.

17 A. If not, I'll read it. I can see. Yes, the whole
18 thing -- well, not just that; what's below as well. The
19 whole black screenshot. Yes.

20 All right. So we look at the highlighted in the
21 row below number 581, so that's the pixel of interest. And
22 then the two predictions for that pixel would be 9312 and
23 9288. Right? So this would be the two prediction in binary
24 expansion.

25 So let's go back to the original slide. So what

1 do these numbers mean? As I said, the original precision,
2 the first precision was 10 bits. So you can represent 1,024
3 numbers. The number 9,000 and something, to represent a
4 number that large needs 14 bits, right? So because 2 to the
5 power of 14 is 16,384.

6 So necessarily here, so the precision that was
7 used was 14 bits. That's the second precision, which is
8 larger than 10 bits, which is the first precision.

9 Q. What evidence do you have for -- oh, and I
10 apologize. Just to be clear, this analysis you just gave in
11 slide 82, that applies to claims 7c and 7d?

12 A. That's correct.

13 Q. And you're showing both reference blocks here, so
14 you thought it was appropriate to treat these together?

15 A. Yes. And I may add that if you look at the lower
16 right side of the picture, you see the name of these verbal,
17 predL0 and predL1. So these are the names for the first and
18 second reference blocks. Sorry. For the first and second
19 predictions.

20 Q. Those predictions, the first and second ones,
21 those are related to the first and second reference?

22 A. Yes. Yes.

23 Q. Can we please have slide 83.

24 Professor, what evidence do you have for claims
25 7e and 7f?

1 A. Yeah. So I've combined the two limitations in
2 this slide. 7e says obtain a combined prediction based at
3 least partly upon the first prediction, in yellow, and the
4 second prediction, in green. Then there will be in 7f a
5 shift of the bits to the right. So let's see the equation
6 at the bottom right.

7 So we see that predL0 and predL1, which I just
8 mentioned, are the first and second prediction. And they
9 combine through this function in Clip3, and you see also in
10 purple this right shift by a number, shift2 bits, which we
11 saw earlier. So that forms pred on the left side, which is
12 a combined prediction.

13 Q. You mentioned, Professor, this pred function here
14 that involves the first prediction and the second
15 prediction. You also mentioned there's something in that
16 function called clip. What does clip do?

17 A. This is Clip3. So it is really the same idea as
18 what I mentioned earlier, clipping operation. So,
19 occasionally, do as an interfact of the interpolation
20 filters, which have some negative value sometimes, you could
21 end up with pixel values that are negative, usually slightly
22 negative. They would be clipped to 0. And similarly at the
23 upper end of the range, you could have values that exceed,
24 again, usually slightly the maximum load value, and it would
25 be clipped to the maximum load value.

1 Q. This clip here or in the standards-based evidence
2 we looked at for the decoding claims, does that affect the
3 opinions you offer in this case?

4 A. Say again, please?

5 Q. Does clip affect the opinions you offer in this
6 case?

7 A. Not at all. So, Number 1, this is still a
8 combined prediction. Number 2, this clip feature is
9 triggered very rarely. So it really is almost immaterial.
10 Given the normal statistics of images, these are pretty rare
11 occurrences, much less than 1 percent of the time.

12 Q. Let's go to slide 84, please.

13 A. Yes.

14 Q. Do the Respondents have any non-infringement
15 arguments about clip?

16 A. Yes. And I notice particularly the last
17 sentence, "To whitewash these differences, Dr. Moulin
18 asserts that the Clip3 operation may sometimes not affect
19 the predicted values, conceding it often does."

20 But I -- as I just explained, the opposite is
21 true. So I never asserted that. In fact, I asserted the
22 exact opposite.

23 Q. Can you explain a bit more about what
24 circumstances might, in a real-life video or image, trigger
25 an clip operation to affect an output value?

1 A. Yes. So the shape of the filter response matters
2 very much. So it has some negative coefficients, so the
3 filter has a certain response which you can visualize.

4 So to obtain at the end a negative value, you
5 need to start with input values that were small to begin
6 with, and it has to be a pattern that matches in a certain
7 sense the response of the filter.

8 So you need to be pretty unlucky for that to
9 happen, okay, which is why I mentioned, in terms of
10 probabilities, these are very small numbers.

11 Q. Let's move on to the next claim element. What
12 evidence do you have for claim 7g?

13 A. Let's move to 85.

14 So 7g says encoding the residual data in the
15 bitstream, wherein the residual data is determined based
16 upon a difference between the combined prediction, in green,
17 and the block of pixels, in purple.

18 So, again, from a VQ Analyzer screenshot, we see
19 a part of a picture. We see the purple block in the center.
20 And the combined prediction is mentioned on the left side,
21 okay? You see prediction unit, 15, 36, 96, 32, 32. And
22 then, in yellow at the bottom of the screenshot, you see all
23 the values that describe the residual data. So this is the
24 connection between the combined prediction and the block of
25 pixels through the residual data.

1 Q. Can we turn to the dependent claims of the '267
2 patent, the dependent encoding claims now?

3 A. Yes.

4 Q. Let's have slide 86, please.

5 What evidence do you have for claims 8 and 9 of
6 the '267 patent?

7 A. Yes. So I grouped again limitations 8 and 9
8 together. So if you read limitation 8, so it's the case
9 where the first motion vector points to a sub-pixel. And so
10 in this example from VQ Analyzer, we see this motion vector
11 called mvL1 on the right side. So the value of mvL1 is
12 minus 79, minus 4. And because everything is representative
13 with quarter-pel precision in pixel land, it corresponds to
14 minus 19.75, minus 1 pixels. So that is sub-pixel accuracy,
15 quarter-pixel accuracy.

16 Then -- yes, so that is basically this operation
17 where we have sub-pixel accuracy.

18 Q. And that's -- Professor that's one of the
19 situations you were describing earlier to us where we're
20 pointing between pixels?

21 A. Yes, in this case quarter-pixel accuracy.

22 Q. And I have a question on slide 86. What are you
23 pointing to for right shifting a sum of a P-tap filter?

24 A. So, okay, limitation 9, okay, you're asking about
25 shifting the sum, right?

1 Q. Yes.

2 A. So this is highlighted in orange. So shifting
3 the sum of that filter output for the first reference block.
4 So if we look down bottom right of the screen, we see that
5 pred is obtained by, again, combining those values I
6 mentioned, 93, 12, plus 92, 88. And as part of this
7 operation, you see there's a right shift by 5.

8 So that is right shifting the result by five
9 bits.

10 Q. And, Professor, I want to ask you about your
11 testing evidence more generally. You've showed on your
12 slides today examples from a particular series of tests.
13 Did you do other tests as well?

14 A. Yes. Let's move to slide 87.

15 Q. This slide refers to -- we'll have to go on the
16 third-party confidential record, but I want to ask you --
17 let's go back to slide 86. I want to ask you about your
18 testing evidence just more generally than what you presented
19 here.

20 There are exhibits cited here on slide 86. Do
21 those exhibits contain additional screenshots of the testing
22 evidence that you collected?

23 A. Well, I have authored many, many screenshots like
24 those. So I am showing one here.

25 Q. And if someone wanted to go look at all of the

1 different screenshots showing these variations of tests for
2 the accused and domestic industry products, they could go to
3 the exhibits listed that are here in slide 86?

4 A. Yes. This is just one representative because I
5 have a limited number of slides.

6 Q. Can I please have slide 87.

7 MR. VERBONCOEUR: And, Your Honor, at this time,
8 we need to go on the third-party confidential record.

9 JUDGE ELLIOT: Very well.

10 (Whereupon, the hearing proceeded in confidential
11 session.)

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1 O P E N S E S S I O N

2 BY MR. VERBONCOEUR:

3 Q. Professor, may we turn to the '714 patent now?

4 A. Yes.

5 Q. Are there any technical concepts we should know
6 for the '714 patent?

7 A. Yes. So, again, the central concept is motion
8 compensation. But here there is added, additional concepts,
9 which is the notion of merging adjacent blocks.

10 So what's the motivation for this? So I show the
11 same pictures I showed earlier of this moving car. And then
12 you see that before this is a car, so the two blocks
13 highlighted in turquoise are likely to have the same motion
14 vector, right, because they belong to the same car, the same
15 car door, in fact, and so it's the same object.

16 So really when you do the matching with a
17 reference frame, you fully expect the two motion vectors, if
18 you compute them, to be the same. And in this case, it
19 would be quite inefficient to send them separately, so a
20 great idea is that we signal that the two -- these two
21 blocks should use the same motion vector. That leads to
22 lots of bit savings, very good idea. So it's an idea that
23 has been fully explored in H.265.

24 And if you move to the next slide, 91, we see how
25 this idea could be used. So this Figure 9 is shown in the

1 '714 patent. And so we have a current block, 900, to be
2 encoded. It's the big square block in the center.

3 And then shown conceptually are five neighboring
4 blocks. They are labeled A0, A1, B0, B1, B2. They could
5 have the same size as the current block or it could be
6 smaller. So it's a conceptual diagram. For instance, A1 is
7 the left neighbor of the current block.

8 But whatever size these blocks are, so if we
9 find, for instance, that, say, the current block, 900,
10 should receive the same motion vector as A1, then we want to
11 signal that to the decoder. So a very efficient way to do
12 that is to construct a list. And in this list, we have
13 quantities that are already known to the decoder, because
14 A0, A1, B0, B1, B2 have been transmitted already, so the
15 decoder knows that. So they are motion vectors. If they
16 have motion vectors, at least.

17 And then if we have a list with, say, four
18 candidates as shown here, A0, A1, B0, B2, the decoder knows
19 that list, and therefore if we send simply the index, we
20 say, well, we just take the second element of the list, so
21 it has index 1, and we signal that identity coder will know
22 to assign the motion vector that was known to be A1 to the
23 current block. So it's extremely -- it's very efficient
24 use. You simply transmit a small merge index.

25 Q. If I understood you correctly, Professor, an

1 encoder could signal a merge index with some value, and the
2 decoder that has built its list would know which motion
3 vector based on that signaling, the merge index signaling?

4 A. That's correct. So yes.

5 Q. So my question to you here on slide 91 is, what
6 happens if A0 and A1 are the same motion vector?

7 A. Right. So that actually happens very often
8 because, going back to my moving car example, you have a
9 physical object, so it is quite likely that there's more
10 than two, there could maybe three or four or even more
11 adjacent blocks that have the same motion vector.

12 So in that case, it will be quite inefficient to
13 have a long list with many candidates and have to spend bits
14 signaling which one. So the idea is that duplicates should
15 be eliminated. So, for instance, if all these motion
16 vectors were the same, a list should really have a single
17 element, right? And so making the list shorter is very
18 important for efficiency in video coding.

19 Q. Why is --

20 A. And also --

21 Q. My apologies.

22 A. Sorry. Trying to remove duplicates in that case
23 is very important.

24 Q. Why is it that signaling for a smaller list would
25 be more efficient than signaling for a bigger list?

1 A. Because the fewer possible values, right? So if
2 I look at it in a very simplistic way, I say, well, there's
3 four choices; I need two bits to signal that. Well, if
4 there are only two choices, I will need a single bit.

5 And, remember, these blocks, there are millions
6 of them per second. So we're talking about saving millions
7 of bits.

8 Q. How do these technical concepts we're discussing
9 relate to the '714 patent?

10 A. Yes. So the obvious way to eliminate duplicates
11 is to say, well, let's evaluate all the candidates. So
12 let's say, for instance, all these A0, A1, B0, B1, B2 have
13 some motion vector. So we just need to compare them, right?
14 And if there are duplicates, we get rid of them.

15 So how many comparisons are needed? So if I have
16 five numbers to compare, I need to look at all possible
17 pairs. So if I have five numbers, there are ten possible
18 pairs, right? So I would need to do ten comparisons.
19 That's the obvious way to do.

20 Unfortunately, that's costly. We need to do ten
21 comparison. Any processing is costly on the hardware. And
22 the big idea of the patent was to come up with an efficient
23 way to reduce number of comparisons needed. And that saves
24 potentially a lot of processing power.

25 Q. And, Professor, in your example you just gave us,

1 you said there are five candidates, and you said, well, you
2 know, of course you'd need ten comparisons. How did you get
3 from five candidates to ten comparisons? What's the math
4 that you did to do that?

5 A. Well, one way to think of that is so if I order
6 them somehow, let's say, in the order shown here starting
7 from A0, then A1, then B2, B1, B0, I would first compare A0
8 with A1. Then I move to B2, and so I compare B2 with A1 and
9 A0. So now I have two comparisons. And move to B1, I
10 compare it with three predecessors. Finally, I get to B0,
11 and I compare with the four predecessors. So I would have 1
12 plus 2 plus 3 plus 4 equals 10.

13 Q. So slide 92, please.

14 What does the patent have to say about its -- how
15 it improved merge mode?

16 A. Yes. So what's highlighted essentially
17 summarizes what I just said, right? So the concept there is
18 to perform a limited number of comparisons between candidate
19 pairs to achieve this removal of redundant candidates, of
20 duplicates, rather than an exhaustive comparison.

21 Q. At a high level, does the '714 patent provide any
22 examples of its solutions?

23 A. Yes. That's shown in my next slide, 93.

24 So this Figure 8b is an embodiment of this
25 concept. So on top of this figure, you see this green,

1 orange, red, and blue highlights and also a purple
2 highlight. And they are labeled A0 through B2. It's the
3 same quantities that we've seen in Figure 9 of the patent.
4 So it's the exact same blocks, just you show them as a color
5 to facilitate the concept.

6 So let's start from the top left of Figure 8b.
7 We see the green A1. That's a neighboring block. And so
8 this flow chart -- and if you go down the flow chart, you
9 see that a question is asked: Does A1 have the same motion
10 as B1? So that would be your first comparison. And if you
11 further the example, you see different boxes have a
12 question. Like the next one, does B1 have the same motion
13 as A1? And so on.

14 So if you do that, you end up with five
15 comparisons, which is less than ten.

16 Q. And, Professor --

17 A. Also -- sorry. Let me add also another advantage
18 of this idea, so, again, it's an embodiment, is that these
19 operations, they can be performed in any order you want.
20 They can even be performed in parallel. So parallel
21 computing, again, there's lots of advantages in hardware.
22 You can do operations faster, which is very important for
23 high-resolution video.

24 Q. Do you know when the inventions of the '714
25 patent were conceived?

1 A. Yes. Let's move to slide 94.

2 The priority date for the patent is November 4th,
3 2011.

4 Q. Do the Respondents challenge this priority date?

5 A. No.

6 Q. And what, if anything, were the inventors working
7 on in November of 2011?

8 A. Let's move to slide 95.

9 So they -- the same month, okay, that the patent
10 was issued, they submitted the invention to JCT-VC, which is
11 this body that handles -- that is responsible for coming up
12 with the H.265 standards. This was revised later, a couple
13 of months later, and the idea was adopted in February 2012.
14 So three months after submission.

15 Q. And, Professor, in your answer just now, you said
16 the same month the patent was issued. Did you mean the same
17 month the provisional application was filed?

18 A. I'm sorry, that's what I meant, yes.

19 Q. Okay. Let's have slide 96, please.

20 Can we move on now to your opinions on
21 infringement and domestic industry for the '714 patent?

22 A. Yes. So I looked at a number of accused
23 products. They are both HP and Amazon products. So HP
24 laptop and desktop computers, Amazon Fire Tablets, smart
25 TVs, and streaming devices. For the accused products for

1 encoding, I looked at HP only. And these came with
2 different chipsets, which are the ones that I've mentioned
3 earlier, AMD, Intel, et cetera.

4 Q. And what products did you consider for your
5 domestic industry opinions?

6 A. Let's move to slide 97.

7 So there, again, I rely -- I consider the same
8 products I have mentioned earlier, Microsoft Surface
9 computers, Xbox, and five Galaxy phones, both for encoding
10 and decoding and, again, with different hardware chipsets.

11 Q. And did you -- let's have slide 98, please.

12 Did you apply the same type of methodology to
13 your analysis of the '714 patent?

14 A. Yes. It is the same logic. Okay, look at
15 decoding evidence, look at the encoding evidence, both using
16 exactly the same procedure that I mentioned earlier.

17 Q. So slide 99.

18 A. For '267.

19 Q. I apologize. Sorry.

20 A. I said the same procedure I considered earlier
21 for '267.

22 Q. Let's have slide 99, please, and I see we have
23 it.

24 Can we turn now to your infringement and domestic
25 industry analyses for the '714 patent?

1 A. Yes.

2 Q. What evidence do you have for the preamble of
3 claim 23?

4 A. Yeah. So let's look at slide 100.

5 So 900, the preamble, it's an apparatus claim.
6 It's an apparatus comprising a processor and a memory
7 including computer program code, the memory and the computer
8 program code configured to perform some operations.

9 And for this, I rely on the H.265 standard again.

10 Q. Did you consider -- let's have slide 101.

11 Did you consider any additional evidence from the
12 preamble of claim 23?

13 A. Yes. So as shown there, the existence of such a
14 processor and memory was admitted both by HP and Amazon.
15 And this was also confirmed by my review of the source code.

16 Q. What evidence did you consider for claim 23a?

17 A. Let's move to slide 102.

18 So in 23a, there's a selection of a first spatial
19 motion vector prediction candidate -- that's in yellow from
20 a larger set -- and this is to be applied to an encoded
21 block of pixels, shown in green, highlighted in green.

22 And so this is illustrated in the standard here,
23 again, H.265, bottom right. So this picture looks very
24 familiar. So you have the current block in green. This is
25 the encoded block of pixels. And then you have five

1 neighbors.

2 And we're going to choose a first spatial motion
3 vector prediction candidate from a set of candidates. And
4 we start with five potential candidates to begin with.

5 And in the standard on the left side, this
6 corresponds to a Section 8.5.3.2.3. So that's the
7 derivation process for spatial merging of candidates.

8 Q. Can I have slide 103, please.

9 Professor, what additional evidence, if any, did
10 you consider for claim 23a?

11 A. Yes. So 23a, so we continue and we say we're
12 going to select a first spatial motion vector prediction
13 candidate as a potential spatial motion vector prediction
14 candidate to be included in the list.

15 And so this process is illustrated on the right
16 side in the H.265 standard. You see, highlighted in yellow,
17 the merging candidate list, which is called mergeCandList,
18 is constructed as follows. And if available, the neighbors
19 are added to the list in a certain order. So A1 will go
20 first, then B1, then B0, and so on.

21 In fact, they can be at most four spatial
22 candidates in H.265. And this is if available. For some
23 reason, it might be that one of those neighboring blocks
24 does not have a motion vector, for instance, so obviously it
25 would not be included in the list.

1 And regarding the motion vector itself, so that's
2 highlighted in green, and we see at the bottom left the
3 variables there are for the motion vectors. They are called
4 mvLXA0, mvLXA1, so on, to mvLXB2. And this X stands for 0
5 or 1, referring to either the first or the second reference
6 frame.

7 Q. Professor, did you consider any evidence for
8 claim 23b that supports your opinion?

9 A. Yes, I did. That's slide 104.

10 So 23b is about "determine a subset of spatial
11 motion vector prediction candidates" -- that's in green --
12 "based on the location of the block associated with the
13 first spatial motion vector prediction candidate."

14 So in this illustration, this is, again, from the
15 H.265 standard on the left. We see that in this case, A1 is
16 a subset. So it has actually only one element. It's a
17 single candidate there, A1. And then the location of the
18 block, so that one is A0.

19 And in the H.265 standard under that section, we
20 see if you look at item 6, variable A1 is set to true. So
21 it means A1 will be available for inclusion on the list.
22 And so the corresponding locations of A1 are called xNbA1
23 and yNbA1. And, likewise, there are coordinates for the
24 block A0, right?

25 So let's move to the next slide, 105.

1 Q. Professor, I apologize, but I'd like to go back
2 to slide 104 and just ask you a question about this.

3 You've got, on the left-hand side of slide 104,
4 the example with A0 and A1.

5 A. Yes.

6 Q. Now, your opinions apply to the other scenarios
7 that would involve B2, B1, and B0?

8 A. Yeah. That's exactly what I wanted to show --

9 Q. Okay.

10 A. -- outside 105.

11 Q. Okay. Let's go to slide 105. What are you
12 trying to show us here?

13 A. So what I've shown is the first line of that
14 table, which comes from H.265. The first line, we have a
15 block location, A0, and a subset, A1. That's what I
16 illustrated on slide 104.

17 So now this process can be repeated. So let's
18 say the block location is B0. Well, the H.265 standard says
19 the subset then is B1. If the block location is B1, the
20 corresponding subset would be A1. If the block location is
21 A2, now the subset is two elements. They are A1 and B1. So
22 what's in the standard there completely reflects limitation
23 23.

24 Q. Part of the claim 23b that's highlighted on slide
25 105 says, "based on the location of the block associated

1 with the first spatial motion vector prediction candidate."

2 How -- if we're looking at your various scenarios
3 here in slide 105, how do you know the subset is based on
4 the location of the block?

5 A. Yes. So that's very easy to determine. Again,
6 look at the first line of this table, which was illustrated
7 in slide 104, A0 was compared with A1. If you look at the
8 figure on the left, A1 is simply on top of A0, right?

9 So the relative location of those two is always
10 fixed. And so that is how it is based on that location.

11 Q. Professor, what evidence do you have for claim
12 23c?

13 A. Yeah. Let's move to slide 106. So there in
14 limitation 23c, there's a comparison of motion information,
15 highlighted in red, of the first spatial motion vector
16 prediction candidate -- that's in yellow; it will be A0 in
17 my example -- with motion information of the spatial motion
18 vector prediction candidate in the determined subset. So
19 that will be A1 in this case. And this has to be done
20 without making a comparison of each possible candidate pair.

21 So, again, illustrating with the example, our
22 yellow candidate is A0, the determined subset in green is
23 just A1, and we only in H.265 compare A0 with A1. We don't
24 compare it with B0, B1, and B2. So that's not -- we don't
25 have an exhaustive comparison.

1 Q. And, Professor, I don't want to you get into any
2 details or confidential information, but did you also
3 consider the source code when you confirmed that there was
4 not -- the process was done without making comparison of
5 each possible candidate pair?

6 A. Yes, I verified that with the source code.

7 Q. And is your opinion that you expressed with claim
8 23c the same for all of the various block locations that you
9 identified for us earlier?

10 A. Correct.

11 Q. What evidence do you have for claim 23d?

12 A. Let's move to slide 107. So limitation 23d is
13 determine to include or exclude, shown in yellow, the first
14 spatial motion vector prediction candidate in the prediction
15 list based on the comparison, as we discussed. So all of
16 these elements are reflected in the H.265 standard.

17 So on the right, again, we see the merging
18 candidate list called mergeCandList, highlighted in red.
19 And the way it's constructed is the way I showed. Again, as
20 an example, the first spatial motion vector prediction
21 candidate would be A1 -- sorry, A0, highlighted in green
22 here.

23 And then on the left side we see that -- so if
24 you look at item 6, available A1 is equal to true, and then
25 the predictions covering those locations for A1 have the

1 same motion vectors and the same reference indices.

2 And then the assignments of motion vectors are
3 shown in green. So for A0, the assignments will be done as
4 shown in equations 8-137 through 139.

5 Q. And two quick questions, Professor, on slide 107.
6 First, what does "availableFlagA0 is set equal to 1" mean?

7 A. Because that one --

8 Q. On the left-hand side there.

9 A. Say again? Sorry.

10 Q. Highlighted in yellow on the left-hand side is
11 "availableFlagA0 is set equal to 1." What does that mean?

12 A. So it means that A0 would be made available, so
13 it will be available for the list.

14 Q. And then it says, "and the following assignments
15 are made." What does that mean?

16 A. Yeah. So these are the assignments of the motion
17 vectors. So if you make it available in the list, then you
18 need to specify the motion vector.

19 Q. And is your opinion with respect to claim 23d the
20 same for all of the block locations you identified for us
21 earlier?

22 A. Yes.

23 Q. Moving on, what evidence do you have for claim
24 23e?

25 A. Let's move to slide 108. So here select a

1 spatial motion vector prediction candidate from the motion
2 vector prediction list for use in decoding the encoded block
3 of pixels.

4 So if we look again at the H.265 standard, so in
5 green, we see N being the candidate at position merge_idx.
6 So merge_idx is the information that was received. So it's
7 the information that identifies that block. And then the
8 candidate at that location is given a name, N here. So
9 that's the correspondence between the two. And then
10 highlighted in red we see, again, merging candidate list in
11 the H.265 standard.

12 Q. So, Professor, we've gone now through each
13 element of claim 23 of the '714 patent, and you've cited the
14 H.265 standard. In your opinion, does the H.265 standard
15 require claim 23 for decoders?

16 A. Yes, it does.

17 Q. Can I have slide 109, please.

18 Professor, do you have any other evidence you
19 considered for claim 23?

20 A. Yes, I did some testing. So if I test an
21 H.265-compliant bitstream, so there would be Task Manager
22 showing that, indeed, this is H.265 video.

23 Q. And same question that I had before with respect
24 to bi-prediction. How do you know that the videos you
25 tested on the products at issue in this case have anything

1 to do with merge mode?

2 A. With merge mode? Let's move to slide 110.

3 So this is an illustration, again same procedure.

4 So you take a picture from the video, you look at a
5 particular block of interest, it's highlighted in red here,
6 and then you see all the relevant quantities in that window.
7 So there's -- so, first of all, if you can -- maybe we want
8 to zoom on the picture so we'll see a little bit better
9 what's written.

10 Q. Which part of the picture, Professor?

11 A. The portion that shows the picture itself.

12 Q. Can you zoom in on the picture, Mr. Moreno?

13 A. So what I want to show is, because it will be
14 hard to read, you see the highlighted block in red? It says
15 "merge" in the block. You will also notice many other
16 blocks around it have "merge," so basically this indicates
17 simply which blocks are in merge mode. And then it -- this
18 will show the two -- there's also motion vectors there.

19 So if you go back to the full resolution, we see
20 also on the right side, there's a merge flag set to 1. So
21 this indicates that merging has been done on that block.

22 Q. And there's also on slide 110, Professor, I see
23 merge_idx. Is that the same merge_idx you were telling us
24 about earlier?

25 A. Yes.

1 Q. And, Professor, did you test the products at
2 issue in this case using the videos that you analyzed?

3 A. Yes.

4 Q. And let's have slide 111.

5 Is slide 111 some depictions of some of those
6 tests that you performed?

7 A. Yes. Again, using the same product I mentioned
8 earlier, yes.

9 Q. Can by please have slide 112.

10 MR. VERBONCOEUR: At this time, Your Honor, we
11 need to go on the third-party confidential record.

12 JUDGE ELLIOT: Very well.

13 (Whereupon, the hearing proceeded in confidential
14 session.)

15

16

17

18

19

20

21

22

23

24

25

1 O P E N S E S S I O N

2 BY MR. VERBONCOEUR:

3 Q. Professor, did you also consider whether products
4 at issue in this case meet claim 15 of the '714 patent?

5 A. Yes.

6 Q. Let's have slide 116.

7 Professor, what evidence did you consider for the
8 preamble of claim 15?

9 A. Yeah. So claim 15 is an apparatus claim. And so
10 the preamble, again, says an apparatus comprising a
11 processor and a memory including computer program code.
12 They are configured to perform some operations. And this
13 was admitted by HP and by -- sorry, by HP, that they have
14 processor and memory that does exactly that.

15 And this was also reviewed, confirmed by my
16 review of the source code.

17 Q. Let's have slide 117, please.

18 Professor, what evidence do you have for claim
19 15a?

20 A. So 15a, select a first spatial motion vector
21 prediction candidate from a set of candidates for a block of
22 pixels. So we see there's again a VQ Analyzer screenshot on
23 the right. So in green, we have a current block of pixels
24 to be encoded. And then in yellow, we have five neighbors,
25 right? So I had mentioned the names A0, A1 through B2.

1 You see, by the way, that these blocks can have
2 different shapes. Some are the same size as the current
3 block; some are smaller. But we need to select one of them,
4 and so that will be practicing -- that we're meeting
5 limitation 15a.

6 Q. Can I have slide 118, please.

7 And, Professor, can you explain slide 118 and
8 this additional evidence you considered to us?

9 A. Yes. So, again, this -- on the right side is a
10 figure from the '714 patent. We see the exact same thing
11 there, the green current block of pixels to be encoded and
12 then the potential five neighbors labeled A0 through B0.
13 And on the left side, this is H.265 video where we see the
14 exact same pattern.

15 Q. Let's have slide 119, please.

16 Professor, did you consider any more evidence for
17 claim 15a from your testing analysis?

18 A. Yes. So to continue my reading, the motion
19 vector highlighted in red, the motion vector prediction list
20 comprises motion information of the spatial motion vector
21 prediction candidate and is used to identify a motion vector
22 prediction candidate.

23 So the list is -- it's a little hard to see on
24 the right side. Maybe we need to focus on the black box
25 over there. We'll see it a bit better. It says motion

1 vector prediction list on top. Yes. This one.

2 So this is the list. And then in B1 -- in number
3 1 is the selected candidate. So this is B1. If you go back
4 to the original resolution for the slide, so we see actually
5 information that pertains to B1. So that's the candidate
6 that is selected.

7 Q. Professor, I notice here that you're not talking
8 about the H.265 standard in using this testing evidence. I
9 just want to make it clear, in your opinion does the H.265
10 standard require encoding claim 15 of the '714 patent?

11 A. Say again?

12 Q. Does the H.265 standard require encoding claim 15
13 of the '714 patent?

14 A. So any decoder -- sorry, any encoder -- so you
15 basically want to look at the video, right? So if it's
16 H.265 video, you would be able to see whether these steps
17 were practiced.

18 Q. Yeah. So you mentioned earlier your testing
19 methodology.

20 A. Yes.

21 Q. And you mentioned that you were relying on this
22 standard for the decoding claims. But for the encoding
23 claims you're looking at testing evidence. I'm trying to
24 explore with you, why that is.

25 A. Yeah, because that's how you see whether, first

1 of all, you have H.265 video between, and then whether the
2 steps of the claims were practiced. So this was confirmed
3 in multiple ways, that there's the analysis of the video
4 that I'm showing here, there's the source code analysis.

5 Q. What evidence did you consider for claim 15b of
6 the '714 patent?

7 A. Yeah. So let's move to slide 120.

8 So this, just to continue, so 15b here, so in
9 yellow, determine a subset of the spatial motion vector
10 prediction candidates. So that's A1 here. Based on
11 location of the block. So in the example in this window,
12 this would be B1. So this is the bottom right.

13 We see the block associated with the first
14 spatial motion vector prediction candidate, B1. And the
15 subset in this case in yellow is A1. And we see the motion
16 vector that is actually associated with these blocks.

17 Q. And a similar question for claim 15 as I had for
18 claim 23. There are multiple locations for blocks that
19 you've identified here on slide 120. Does your analysis
20 apply to all the various possible block locations?

21 A. Yes, it does. Yeah.

22 Q. What evidence did you consider for claim 15c?

23 A. Let's move to the next slide.

24 So in 15c, there's a comparison of the motion
25 information of the first spatial motion vector prediction

1 candidate, shown in green, so B1 in this example, with
2 motion information in the determined subset. So that's in
3 yellow. That's A1 in this example.

4 And as the VQ Analyzer screenshot shows here, so
5 A1 and B1 are identified with these two elements from the
6 claim, from the claim limitation 15c.

7 Q. And we're on the public record now, and I don't
8 want you to get into any confidential information, but did
9 you look at the source code as well to confirm the part of
10 claim 15c in gray that says, "without making a comparison of
11 each possible candidate pair"?

12 A. Yes. So the source code shows that, indeed, the
13 comparison is never -- is not exhaustive. So it is -- it
14 meets, again, the limitation 15c.

15 Q. Let's have slide 122, please.

16 What evidence did you consider for claim 15d?

17 A. For 15d, so that's determine to include or
18 exclude the first spatial motion vector prediction candidate
19 in the list. So that's highlighted in green.

20 And so this is done based on the comparison with
21 -- this is highlighted in yellow -- with motion information
22 of the spatial motion vector prediction candidate. So that
23 is done, again -- that is illustrated again in this VQ
24 Analyzer screenshot. So B1 being the spatial motion vector
25 prediction candidate.

1 And we see it has a little star next to it. So
2 that means it has been included in the list.

3 Q. What evidence did you consider for claim 15e?

4 A. Say again, sorry?

5 Q. Let's have slide 123.

6 What evidence did you consider for claim 15e?

7 A. Oh, for 15e? So 15e is cause information
8 identifying the candidate from the list to be transmitted to
9 a decoder or stored.

10 So, again, looking at the VQ Analyzer screenshot,
11 we see in this case highlighted in yellow this merge_idx of
12 1. So that is the information identifying that candidate.

13 Q. And based on the testing analysis that you did,
14 what is your conclusion about whether the encoding products
15 at issue in this case practice claim 15?

16 A. Yeah, they do practice them.

17 Q. Can we please have slide 124.

18 MR. VERBONCOEUR: And, at this time, Your Honor,
19 we need to go on the third-party confidential record.

20 JUDGE ELLIOT: Very well.

21 (Whereupon, the hearing proceeded in confidential
22 session.)

23

24

25

1 O P E N S E S S I O N

2 MR. CANAVERA: Okay to proceed, Your Honor?

3 JUDGE ELLIOT: Yes.

4 CROSS-EXAMINATION

5 BY MR. CANAVERA:

6 Q. Good afternoon, Dr. Moulin.

7 A. Good afternoon, Mr. Canavera.

8 Q. Let's briefly discuss the testimony you just
9 gave. So you talked about the '714 patent and how it
10 improved merge mode, right?

11 A. Correct.

12 Q. Let's pull up slide 93 from Dr. Moulin's deck.

13 And you discussed this slide, and you discussed
14 the '714 patent improves merge mode and you gave an example
15 from the patent. Right?

16 A. Correct.

17 Q. Now, you would agree that the '714 patent did not
18 itself invent merge mode, though, right?

19 A. I agree.

20 Q. And on slide 93 here, do you see on the left, you
21 have Figure 9?

22 A. Yes.

23 Q. And you've color-coded these five spatial
24 neighbors?

25 A. Yes.

Heritage Reporting Corporation
(202) 628-4888

1 Q. Now, you used that same -- or a similar diagram a
2 few other places.

3 Could we go to slide 102.

4 And here you see on the right, you have a similar
5 diagram. This one is from the H.265 spec, right?

6 A. That's correct.

7 Q. And then just one more example. If you go to
8 slide 91 now, in this you were discussing sort of background
9 of merge mode, right, and you had a similar diagram on the
10 left?

11 A. That's correct.

12 Q. Now, just to make sure I'm understanding how
13 you're connecting these dots, you're not suggesting that
14 this arrangement of five spatial neighbors is something that
15 the '714 patent invented, are you?

16 A. This particular arrangement, not.

17 Q. And you'd also agree the '714 patent isn't what
18 came up with these five labels in particular, A0, A1, B2,
19 B1, B0?

20 A. No. These are widely used labels.

21 Q. Okay. So on this slide and I think on 93, we
22 might go back there, but you were discussing the issue of
23 removing redundancy in a motion vector prediction list?

24 A. You said slide 93?

25 Q. I think you discussed it on both. Let's go to

1 slide 93, yeah.

2 And then on this slide, you discussed removing
3 redundancy in a spatial motion vector prediction list,
4 right?

5 A. Correct.

6 Q. Now, you're not -- again, I just want to clarify
7 where the '714's improvement to merge mode begins and ends.

8 You're not contending that the '714 patent
9 invented removing redundancy in the spatial motion vector
10 prediction list, are you?

11 A. No, I don't.

12 Q. And I think on this slide, you also discussed
13 doing these comparisons between these five spatial
14 neighbors. Is that right?

15 A. These five what?

16 Q. You discussed comparisons between the five
17 spatial neighbors?

18 A. Yes.

19 Q. And you discussed that the '714 patent was trying
20 to reduce the number of comparisons that were needed?

21 A. That's correct.

22 Q. And, again, you're not suggesting that the '714
23 patent is what invented the idea of reducing the comparisons
24 between the spatial neighbors, right?

25 A. Well, that idea had been discussed and attempted

1 before. The '714 patent is the first that came up with
2 really a good solution, which was actually adopted in the
3 standards. So the goal had been stated before, but no one
4 had found a good solution.

5 Q. Okay. So let me -- I think I followed that, but
6 let me rephrase it and see if we can get on the same page.

7 So you would agree that it was known before the
8 '714 patent to reduce the number of comparisons performed
9 when removing duplicates from the motion vector prediction
10 candidate list, right?

11 A. The idea was -- no, yes. Again, there were no
12 good solutions.

13 Q. Let's go -- we can actually stay here on slide
14 93.

15 You were discussing in reducing the comparisons
16 -- sort of maximum number of comparisons that could be
17 performed, right?

18 A. Correct.

19 Q. And you would agree that one thing you discussed
20 was not performing exhaustive comparisons?

21 A. Correct.

22 Q. And that requirement is reflected in the claims
23 that are asserted here, for instance, claim 23?

24 A. Say again, please?

25 Q. The requirement to not do exhaustive comparisons

1 is reflected in the claims, right?

2 A. That's correct, yes.

3 Q. Let's go to slide 106.

4 Is it fair to say that the gray language you have
5 highlighted here is what reflects the idea of not performing
6 exhaustive comparisons?

7 A. Yeah, those three blocks, B0, B1, B2, are not
8 evaluated. They're not part of the comparisons.

9 Q. So I was referring to the claim language itself.
10 You see you have that excerpted at the top of the slide?

11 A. Yes. So it says, "compare motion information,"
12 and I'm reading the end, "without making a comparison of
13 each possible." So that's the exhaustive search you were
14 asking about, and so that's why I highlight in gray B0, B1,
15 and B2, because those are not included in the comparison.

16 Q. Okay.

17 A. Only A0 and A1 are compared.

18 Q. Now, you said if -- you would agree that the set
19 that's recited in this claim is the set of A0, A1, B0, B1
20 and B2, right?

21 A. Yeah, that's the original set of five neighbors,
22 yes.

23 Q. And I think you said that with five members in
24 the set, the exhaustive comparisons, that would take ten
25 comparisons, correct?

1 A. Yes. So each of them had a motion vector, and we
2 had to compare these five motion vectors, that would take
3 ten comparisons for an exhaustive search.

4 Q. Okay.

5 A. Exhaustive comparison. Sorry.

6 Q. Pardon me. I think you actually described
7 something -- I actually have a diagram I want to bring up.
8 I think we're on the same page, but let me show you briefly.
9 Can we bring up RDX-122C.2.

10 I think you actually gave testimony earlier
11 that's consistent with this, but let me just double-check.
12 Do you see on this slide there are the five labels for the
13 five spatial neighbors that we've been discussing? A1, B1,
14 B0, A0, and B2?

15 A. Yes.

16 Q. And do you remember how you were discussing how
17 you get the ten maximum comparisons earlier?

18 A. Yes.

19 Q. And you see, for instance, I have labeled on this
20 slide comparisons 1, 2, 3, and 4 in blue?

21 A. I see, yes.

22 Q. Because A1 is compared to all the other four
23 neighbors?

24 A. Yes, I see that.

25 Q. And then I added 5, 6, 7 in red for the other

1 three remaining comparisons for B1?

2 A. Yes.

3 Q. And then 8 and 9 for B0 and 10 for A0?

4 A. Yes, I see that.

5 Q. That's how you were getting to the ten maximum,
6 right?

7 A. That's one way.

8 Q. Okay. Yeah, that's fair.

9 So let's say this: If we think about that claim
10 language, without making a comparison of each possible
11 candidate pair, you said the inventors got down to six
12 comparisons, right?

13 A. I said five in one example, in one embodiment.

14 Q. Okay.

15 A. The H.265 standard has five comparisons.

16 Q. Right. So H.265 has five, but you would agree
17 the inventors of the '714 patent reduced the worst-case
18 scenario for comparisons to six, right?

19 A. That's a worst-case scenario. It's important to
20 understand it's a worst-case scenario. So most of the time,
21 it will not be six; it will be less.

22 Q. Okay. So the worst-case scenario the inventors
23 came up with was six. The worst-case scenario H.265 has is
24 five. Is that fair?

25 A. That's correct, yes. Again, this is just an

1 embodiment, right? The claims themselves don't specify a
2 number. It does not say five, six, seven, eight. Nothing.

3 Q. So the claim itself would cover a situation where
4 there's only one comparison performed, correct?

5 A. Well, that would be a trivial case. You are
6 saying there would be only two blocks to be evaluated and
7 now only one comparison is made.

8 Q. So you would agree that's within this language
9 that we have on the screen?

10 A. So if I understand your example well, if you say
11 the original subset has only two candidates, then
12 necessarily there's only one comparison.

13 Q. Again, let's look at this hypothetical. There's
14 five members of the set. If we only perform one comparison,
15 so between two members, that would fall within this claim
16 language, right?

17 A. So if you have five neighbors like here, to have
18 full comparisons we need ten comparisons, correct.

19 Q. And you just agreed with me the claim doesn't
20 require any specific number of comparisons, correct?

21 A. The claim does not even specify the size of the
22 subset -- of the set. It does not say there has to be five
23 neighbors. It does not put any number here.

24 Q. So in this example where we have five neighbors,
25 if there were nine comparisons performed, that would fall

1 within this claim language, right?

2 A. At some step, yes. This would be applied in
3 multiple steps.

4 Q. And eight comparisons would fall within this
5 claim language, right?

6 A. You need to tell me how this comparison will be
7 made, because the details are important. So, again, sir,
8 maybe yes.

9 Q. But you agree, you call this the claim language
10 not exhaustive, right? Those were your words?

11 A. Yeah. We can call it non-exhaustive because we
12 use -- we don't do every possible comparison. We exclude
13 some. We do a limited number of comparisons. That's
14 essential.

15 Q. So you would agree this claim language covers any
16 number of comparisons, as long as it's less than all of
17 them, right?

18 A. Correct. Again, it depends how you use it. So
19 some -- because you're going to apply this in multiple
20 steps. And so there could be a trivial step, as I said. If
21 you have only two candidates, there's only one comparison.
22 That's trivial. But at some point, you're going to face the
23 situation where there will not be an exhaustive comparison,
24 and then the claim will be practiced.

25 Q. So let's talk about the comparisons that are done

1 in H.265.

2 Can we bring up slide 105 from Dr. Moulin's deck.

3 So now what we show here on the screen, this is
4 your table on the right-hand side, right?

5 A. Well, it's not my table. It comes from the H.265
6 standard.

7 Q. The information you put in there comes from the
8 H.265 standard?

9 A. Yes.

10 Q. And you're correlating using the H.265 standard
11 at this block location to the claim language subset, right?

12 A. Yes.

13 Q. Now, you have four rows in your table, but you'd
14 agree with me this reflects five comparisons, correct?

15 A. Say again, please?

16 Q. So I just want to clarify. You have four rows in
17 the table, right?

18 A. Four what?

19 Q. Four rows.

20 A. Yeah, there are four rows to the table, yes.

21 Q. But you agree with me this reflects five
22 comparisons because that last row has two different
23 comparisons?

24 A. That's correct.

25 Q. And the last row of the comparisons are B2 to A1

1 and also B2 to B1, right?

2 A. That's correct.

3 Q. And this table itself -- let me ask it this way:
4 This table itself is not actually in the H.265 spec, is it?

5 A. What I've shown, if you look somewhere else in my
6 presentation, so there's an order that is specified in H.265
7 for making those comparisons.

8 Q. How about this? It's fair to say, in the spec,
9 each of these five comparisons is specifically defined,
10 right?

11 A. Correct.

12 Q. And you're not aware of any other comparisons
13 beyond these five that are defined in H.265, are you?

14 A. Yeah, H.265 describes how exactly this comparison
15 should be made and in which order.

16 Q. So, for example, H.265 doesn't have a situation
17 where A0 is compared to B1, correct?

18 A. No, it does not.

19 Q. There's no situation where you move around the
20 frame and somehow you compare those two neighbors, correct?

21 A. No. I've shown that in my presentation. So this
22 prescribed order and proscribed comparisons, which are shown
23 in this table.

24 Q. So let's think about the current block. Do you
25 understand what I mean by "current block"?

1 A. Yes.

2 Q. That -- on the left-hand side of slide 105, that
3 sort of unlabeled rectangle in the middle?

4 A. Correct.

5 Q. So that block, the current block sort of moves
6 across a frame as you decode it or encode it, right?

7 A. I'm not sure what you mean exactly. So each
8 block is considered in the frame. So the current block is
9 set to one location, at one point. And then in the raster
10 scan, then you move to the next block and you cover the
11 entire slice like this.

12 Q. So as I move across the frame, it doesn't matter
13 which current block I'm looking at; the only five
14 comparisons that are defined are always those same five
15 comparisons, right?

16 A. Yeah, the geometry shown here is the same no
17 matter where the current block is.

18 Q. So a product implementing H.265 will never
19 determine a subset other than those five you have shown
20 there? Pardon me, those four you have shown there, correct?

21 A. A product implementing -- you mean H.265 encoding
22 or decoding?

23 Q. Decoding.

24 A. Decoding, okay. So it would have to, again,
25 consider -- work with the current block and the exact same

1 five neighbors that you see here, no matter where it is
2 located in the frame.

3 Q. And not only will it use the same five neighbors,
4 it will always use those same five subsets that -- sorry,
5 those same four subsets you've defined, right?

6 A. Yeah. Let me just be clear on one thing. When I
7 speak about five neighbors, they have to be available. So,
8 for instance, if the current block is the very first one,
9 the top left corner, then obviously there are no upper
10 neighbors, there are no left neighbors, so none of those is
11 available, right?

12 So this picture assumes implicitly that the five
13 neighbors are there, okay?

14 Q. And if a neighbor is not there, you're only going
15 to get fewer comparisons, correct?

16 A. Yeah, it will be simply not available. So, for
17 instance, if we're on the top of the picture, if the block
18 was on the top of the picture, there would be no B0, B1, B2.
19 There would be potentially only A0 and A1 left.

20 Q. So in that example you just gave, like the second
21 row, there's no way to compare B0 and B1 in that situation,
22 right?

23 A. Yeah, there are no B's in this case. None of
24 them is available.

25 Q. It sounds like in that situation you just gave,

1 the only row here that would actually potentially result in
2 a comparison is that first one you have shown, right?

3 A. That's correct.

4 Q. So could I generalize it and say if the neighbors
5 shown on the subset column are not available, then the
6 neighbor in the block location column cannot be compared to
7 them, right?

8 A. Yeah. For a comparison to be made, the block has
9 to be available. So either -- obviously it has to be
10 physically present. It cannot be, say, on the top of the
11 frame that does not exist, if you're looking at the first
12 row of blocks.

13 Moreover, there has to be motion vector. So it
14 could be in the middle of the picture, but the block, say,
15 above us doesn't have a motion vector.

16 Q. Let me ask you about some issues on the '267
17 patent.

18 A. Yes.

19 Q. Could we bring up slide 27, please, of
20 Dr. Moulin's deck.

21 Dr. Moulin, you discussed in your testimony
22 earlier the improvement bi-prediction that the '267 patent
23 came up with, right?

24 A. Yes.

25 Q. And you discuss the '267 patent's improvement to

1 bi-prediction using Figure 11 of the '267 patent, correct?

2 A. Yes.

3 Q. And slide 27 is where you use that Figure 11?

4 A. Correct.

5 Q. Now, you're aware, aren't you, that the inventors
6 of the '267 patent actually provided another figure right
7 before this one in the '267 patent that provides some
8 important context to what the improvement of Figure 11 is,
9 right?

10 A. Correct.

11 Q. You're familiar with Figure 10 of the '267
12 patent?

13 A. I believe that was the number, yes.

14 Q. Sure. Well, let me bring that up.

15 Could we bring up RDX-122C.3.

16 Figure 11 on the bottom of this slide, that's the
17 same one you just showed, right?

18 A. Yes.

19 Q. Figure 10 is the one we were just referring to?

20 A. Yes.

21 Q. And you didn't discuss Figure 10 in your
22 testimony, did you?

23 A. Today, no.

24 Q. You would agree that Figure 11 is disclosing the
25 invention of the '267 patent. Is that fair?

1 A. Yes, it illustrates the invention.

2 Q. And you would agree that Figure 10 is showing
3 bi-prediction as it existed before the '267 patent, that the
4 '267 patent was trying to improve upon. Is that fair?

5 A. That's correct.

6 Q. Now, you would agree with me that there are two
7 differences between Figures 10 and 11, correct?

8 A. What are those two?

9 Q. Do you recall at your deposition that I asked you
10 that question and you -- and you --

11 A. Yeah, but I saw more than two. So today you're
12 saying two, and that's why I'm asking which ones, because I
13 saw more than two.

14 Q. Can we pull up Dr. Moulin's deposition --
15 Dr. Moulin's deposition, 466:11 to 18.

16 Do you see, Dr. Moulin, starting at line 11, I
17 asked you this question: "So it sounds like there -- is it
18 fair to say that are two differences between Figure 11 and
19 Figure 10, right?"

20 A. I said that.

21 Q. And you said, "Conceptually, the two differences
22 are the third box, what precision that we shift -- what bit
23 depths are we shifting to and also the treatment of the
24 rounding offsets after the addition is made."

25 A. Yes, that's correct. But you note the word

1 "conceptually," and you may remember you -- this is a bit
2 out of context. There was a whole discussion before. There
3 were more differences. And then we agreed they are not
4 significant.

5 So that's why I want to make clear today which
6 are the two differences you are thinking about. Is it the
7 same ones?

8 Q. So you'd agree there are two significant
9 differences between the first two?

10 A. I do agree, yes.

11 Q. And any other differences are insignificant?

12 A. I do agree, yes.

13 Q. So let's go to the next slide. And on slide 4
14 here, you see I've highlighted one box in Figure 10 and one
15 box in Figure 11?

16 A. Yes.

17 Q. And these two boxes relate to how a rounding
18 offset is applied, right?

19 A. Correct.

20 Q. And this is one of those two significant
21 differences you referred to, right?

22 A. Correct.

23 Q. And you agree that rounding offsets are not
24 recited in any of the claims that are asserted right now in
25 this investigation, right?

1 A. That's correct.

2 Q. And you understand that running offsets are
3 recited in some dependent claims that are not asserted?

4 A. Say again?

5 Q. Do you understand that rounding offsets are
6 recited in some dependent claims that are not asserted in
7 this investigation?

8 A. I would have to review that because I only
9 reviewed those that are asserted for my testimony.

10 Q. Do you recall providing opinions on claim 29 of
11 the '267 patent at one point?

12 A. Yeah, I remember reading it at some point.

13 Q. Now, let's go to the next slide, slide 5.

14 And you see on this slide, I have two boxes
15 highlighted in Figure 10 and two boxes highlighted in Figure
16 11. Right?

17 A. Yes.

18 Q. And these two pairs of boxes relate to how
19 shifting operation is performed. Yes?

20 A. Correct.

21 Q. And looking at Figure 11, you would agree this
22 aspect of Figure 11 is reflected in the claims that are
23 asserted in this investigation, right?

24 A. That's correct.

25 Q. Now, while these blocks, the language in them is

1 referring to shifting and bit depths, you would agree with
2 me that these four blocks are referring to rounding,
3 correct?

4 A. Yes, I agree.

5 Q. And you agree that in Figure 10 and Figure 11,
6 both of those figures, you finish with a bit depth that's
7 referred to as N. Right?

8 A. Yeah. Let me just have a caveat to my answer.

9 So --

10 Q. Sorry. Sorry, I think you're referring to the
11 answer I've already moved -- the question I've already moved
12 past. If your counsel would like to ask further, I'm going
13 to stick to my questions.

14 A. Okay.

15 Q. So you would also agree that Figure 10 and Figure
16 11, both of those processes start with the same bit depth as
17 well, right?

18 A. Yes, we can assume the same input bit depth is
19 used in both figures.

20 Q. And in Figure 10, looking at that one, the boxes
21 I have highlighted in yellow, you agree that those are
22 describing rounding down to that same bit depth in the
23 middle of the process, right?

24 A. That's correct.

25 Q. And before the combination at that circle with

1 the plus in it?

2 A. That's correct.

3 Q. But in Figure 11, you would agree that the
4 difference with these two boxes highlighted in yellow is
5 that you're not rounding down to that bit depth in the
6 middle of the process, right?

7 A. You may, in fact, not be rounding at all, is the
8 caveat I wanted to make. It depends on the value of M. If
9 M is large enough there will be no rounding.

10 Q. So you are saying the -- in Figure 11, the two
11 boxes that are highlighted, there may be no rounding at all?

12 A. If M is large enough, there is going to be no
13 rounding.

14 Q. So it's fair to characterize the invention shown
15 in this contrast between Figures 10 and Figure 11 that the
16 inventors gave us as rounding happens at the last stage
17 after two bi-prediction signals are added together, right?

18 A. The rounding offset, you mean?

19 Q. Let me say that again.

20 So do you agree it's fair to characterize the
21 invention as rounding happens at the last stage after two
22 bi-prediction signals are added?

23 A. Oh, I see. Yes. So the yellow box is
24 highlighted, but shifting in this last stage after box --
25 after adding the rounding offset, I agree.

1 Q. So the invention reflected in Figure 11 is
2 performing rounding at the last stage instead of in the
3 middle of the process, right?

4 A. That's what I want to clarify what you mean by
5 last stage, because the last stage is the very end of the
6 process after combining the two. But you are referring here
7 to each individual prediction, right? That's what you call
8 the last stage for each individual prediction?

9 Q. Well let me say it this way: If someone
10 characterized the invention as rounding happens at the last
11 stage after two bi-prediction signals are added, would you
12 disagree with them?

13 A. I find the question ambiguous because it's the
14 last stage of what? So, usually, you describe a process
15 clearly and then you say what is the last stage of this
16 process. I want to make sure I understand what you mean by
17 "last stage."

18 Q. Okay. Let me go somewhere else and let's see
19 what the inventors thought of that characterization. Okay?
20 So let's go to slide 30 in your deck.

21 And you recall discussing this slide?

22 A. Yes.

23 Q. And you were discussing this document -- can I
24 call this shorthand D321?

25 A. Okay.

1 Q. That's what this slide is showing, right?

2 A. You see D321?

3 Q. Yeah.

4 A. Okay.

5 Q. Am I -- this is the document that's commonly
6 referred to as D321, right?

7 A. Yeah, this is fine. Yes.

8 Q. And D321, you discuss this in terms of what the
9 inventors were contributing to the Working Draft of H.265,
10 right?

11 A. Correct.

12 Q. And so this document, D321, was written by the
13 three inventors on the '267 patent, right?

14 A. That's correct.

15 Q. And in this document, this proposal, the
16 inventors describe the invention that would eventually be
17 patented in the '267 patent, right?

18 A. Yes.

19 Q. And D321 proposes situating a rounding operation
20 in a way that reduces the precision of a combined prediction
21 as the last step of the bidirectional averaging process for
22 motion compensation, right?

23 A. I don't see the word "last step" here.

24 Q. Can we bring up paragraph 63 of Dr. Moulin's
25 infringement report.

1 This is paragraph 63 of your infringement report.
2 You see the beginning of paragraph 63? It says, "JCTVC-D321
3 proposes situating a rounding operation"?

4 A. Okay. Yeah, I see it now. Yes.

5 Q. That's a fair characterization?

6 A. Yes. This is -- it's very clear to me what the
7 last step is now.

8 Q. So let's go back to that slide we were just
9 looking at. So back on slide 30 of your slide deck,
10 Dr. Moulin.

11 A. Yes.

12 Q. You have two -- is it fair to say these two text
13 callouts are things you extracted from D321, right?

14 A. Say again.

15 Q. Those two paragraphs you have on the screen here
16 on slide 30, those are two things you excerpted out of D321?

17 A. That's correct, yes.

18 Q. And you applied that highlighting to this slide?

19 A. Yes.

20 Q. Okay. And you use that highlighting to describe
21 what the inventors' contribution was, right?

22 A. To highlight it, yes.

23 Q. So I want to look at a few things that are right
24 here on this screen that you didn't highlight, okay?

25 A. Okay.

1 Q. So in the top excerpt, do you see where it says,
2 "The rounding is performed at the last step after both
3 prediction signals are added"?

4 A. I see that, um-hum.

5 Q. So that's a fair characterization of the
6 disclosure here, right?

7 A. Yes.

8 Q. And do you see in that same top excerpt, there's
9 a parenthetical and it says, "The idea is similar to
10 performing rounding as the last step for bilinear
11 interpolation described by Qualcomm earlier."

12 A. Correct.

13 Q. And do you see there's a 2 in square brackets?

14 A. Yes, I see that.

15 Q. Do you know what that refers to, right?

16 A. It's a reference to a document.

17 Q. A previous disclosure from some Qualcomm
18 inventors, right?

19 A. That's correct.

20 Q. And D321 shows that the inventors of the '267
21 patent thought their technique was similar to what the
22 Qualcomm people disclosed earlier, right?

23 A. Well, similar in the sense that it is related
24 work? Of course, it's a very different problem, right?
25 Qualcomm was concerned with interpolation. So this is -- as

1 I mentioned earlier here, so this was bilinear
2 interpolation. So here it's a different problem, but in
3 that sense, yes, they meant similar.

4 Q. And in that sense, you mean it was similar in the
5 sense that they were moving the rounding to the last step,
6 right?

7 A. Again, depends exactly which last step. So the
8 last step there, I would have to review. It may be quite
9 different from this last step. So it's a general idea, you
10 know, you have a signal crossing chain. You need to do
11 rounding at some point. And in both cases, you may do it at
12 the last step.

13 JUDGE ELLIOT: Mr. Canavera, I would like to take
14 our afternoon break sometime in the next few minutes.

15 MR. CANAVERA: Your Honor, if you'll indulge me,
16 I think I have -- I might have just five minutes left.

17 JUDGE ELLIOT: Very well.

18 BY MR. CANAVERA:

19 Q. Now, I want to look in the bottom excerpt you
20 have here on slide 30.

21 A. Yes.

22 Q. And do you see where it says, "Using this change,
23 rounding happens at the last stage, after two bi-prediction
24 signals are added"?

25 A. Yes.

1 Q. Again, that's how the inventors of the '267
2 patent characterized their own invention at the time they
3 were making it, right?

4 A. Correct.

5 Q. And let's look at one last passage here. Do you
6 see in the bottom excerpt, the first sentence under
7 Conclusions, do you see it says, "This contribution proposes
8 a minor fix on how the bidirectional prediction is
9 generated"? Do you see that?

10 A. Yes, I do.

11 Q. That's what the inventors described their
12 disclosure as, a minor fix, correct? Yes or no, please.

13 A. This is Scandinavian humbleness, yes.

14 Q. Now --

15 THE REPORTER: Sorry.

16 THE WITNESS: This is Scandinavian humbleness.
17 So people don't like to boast. And this is a minor fix? In
18 many people's opinion, it's not a minor fix. In the opinion
19 of the JCT-VC, it's not a minor fix. I viewed that as the
20 inventors were humble.

21 BY MR. CANAVERA:

22 Q. In the inventors' opinion, it was a minor fix,
23 right?

24 A. They wrote that clearly as you read to me, yes.

25 Q. Did you review the deposition transcripts of the

1 inventors that were in this investigation?

2 A. Yes, I did.

3 Q. And did you review the deposition transcript of
4 Mr. Lainema?

5 A. Yes, I did.

6 Q. And you know that Mr. Lainema was asked as part
7 of this investigation whether he still agrees with the
8 characterization that the invention was a minor fix? You
9 know he was asked that, right?

10 A. I know that, yes.

11 Q. And you know that he said, I think it's a small
12 software change? You know that's what he responded?

13 A. Yes. I'm not surprised. It's the same idea as,
14 you know, being modest about your own invention.

15 MR. CANAVERA: Pass the witness.

16 JUDGE ELLIOT: Very well. Ms. Ducca, anything?

17 MS. DUCCA: Nothing from Staff, Your Honor.

18 JUDGE ELLIOT: Very well. Mr. Verboncoeur?

19 MR. VERBONCOEUR: No redirect, Your Honor.

20 JUDGE ELLIOT: All right. Dr. Moulin, thank you
21 very much.

22 THE WITNESS: Thank you, Your Honor.

23 (The witness stood down.)

24 JUDGE ELLIOT: All right. So I have 3:03. Let's
25 come back at 3:20, 3:20.

1 (A recess was taken at 3:04 p.m., after which the
2 proceedings resumed at 3:20 p.m.)

3 MS. CIELUCH: Jennifer Cieluch for Nokia. Our
4 next witness is Mr. Herrington.

5 JUDGE ELLIOT: I'm sorry. Hold on just a second.
6 Okay. Say that again, please.

7 MS. CIELUCH: Jennifer Cieluch for Nokia. Our
8 next witness is Ryan Herrington. However, Respondents have
9 an objection to one of our demonstratives.

10 JUDGE ELLIOT: Very good.

11 MS. SHANBERG: Your Honor, Stefani Shanberg for
12 the Amazon Respondents and speaking on behalf of all
13 Respondents.

14 JUDGE ELLIOT: Can you come to the podium?

15 MS. SHANBERG: I know. This is terrible.

16 JUDGE ELLIOT: I wanted to reduce the buzz or the
17 twang, so I turned off my speaker up here and I am having
18 trouble hearing you.

19 Go ahead.

20 MS. SHANBERG: Is that better?

21 I don't know if you are hearing it, but we are
22 getting terrible feedback.

23 JUDGE ELLIOT: Anyway, Go ahead.

24 (Whereupon, the hearing proceeded in confidential
25 session.)

1 O P E N S E S S I O N

2 MS. CIELUCH: Your Honor, we call Mr. Ryan
3 Herrington to the stand.

4 Whereupon--

5 RYAN HERRINGTON,
6 having been first duly sworn/affirmed, was examined and
7 testified as follows:

8

9 THE WITNESS: I do.

10 DIRECT EXAMINATION

11 BY MS. CIELUCH:

12 Q. Hello, Mr. Herrington. Can you please state your
13 full name for the record?

14 A. Yes. It is Ryan N. Herrington.

15 Q. Why are you here today?

16 A. I am here because I was retained to offer
17 opinions as to the economic prong of the domestic industry
18 requirement; specifically, to two of Nokia's licensees,
19 Microsoft and Samsung, as well as offer opinions related
20 to the Respondents and whether they had commercially
21 significant inventory and/or significant domestic
22 operations.

23 Q. So the issues of economic domestic industry,
24 that's disputed here?

25 A. It is.

Heritage Reporting Corporation
(202) 628-4888

1 Q. And the issue of whether Amazon has commercially
2 significant inventory, that's also disputed?

3 A. Yes. And/or significant domestic operations,
4 I believe.

5 Q. Now, let's turn to slide 2.

6 Did you create this summary of your
7 qualifications?

8 A. Yes. This is a summary of my qualifications,
9 including my experience. I have been doing economic
10 analyses for over 20 years now.

11 MS. CIELUCH: Your Honor, Complainants offer
12 Mr. Ryan Herrington as an expert in economic analysis and
13 evaluation of the video-capable marketplace.

14 JUDGE ELLIOT: Very well.

15 BY MS. CIELUCH:

16 Q. Mr. Herrington, did you testify just a few weeks
17 ago in the 1379 investigation?

18 A. I did.

19 Q. And at a high level, without getting into CBI
20 quite yet, what were your opinions that you offered in 1379?

21 A. At a high level, it was that the licensees,
22 specifically Microsoft and Samsung, made significant
23 investments in plant and equipment and labor and capital
24 associated with the domestic industry products.

25 And it was also my opinion that the Respondents

1 maintained commercially significant inventory and have
2 significant domestic operations.

3 Q. And you created a slide on this, right? So if we
4 could turn to the next slide.

5 Are these the domestic industry products that you
6 evaluated in 1379?

7 A. Yes. These are them. The Microsoft Surface, the
8 Microsoft Xbox, and the Samsung Galaxy products.

9 Q. And these are the same domestic industry products
10 that are at issue in this investigation?

11 A. Yes. It's the same domestic industry products.
12 I understand for my purposes it is similar technology. It's
13 related to the encoding and decoding of video. And it's the
14 same accused products outside of, I believe, some Amazon
15 cameras.

16 Q. At the 1379 hearing, did you provide the basis
17 and support for your significance opinions about these
18 investments?

19 A. Yes, I did.

20 Q. And what information did you rely on?

21 A. So I relied on the financial documents that were
22 actually produced by the licensees. And this was produced
23 from their SAP systems. And then that information was
24 corroborated with deposition testimony from three different
25 deponents, two deponents from Microsoft, one deponent from

1 Samsung. And then there was also a declaration from the
2 Samsung deponent as well.

3 Q. Why is your 1379 testimony relevant to this
4 investigation?

5 A. Yes. So I may have jumped a little ahead in the
6 sense that it's similar technology, for my purposes, in the
7 sense that we are talking about the ability to encode or
8 decode video, again, from an economic perspective.

9 It's the exact same domestic industry products,
10 the Surface, the Xbox, and the Galaxy. And it's also the
11 same accused products outside of the Amazon cameras.

12 MS. CIELUCH: Your Honor, we're going to get into
13 some third-party CBI. If we could go on the confidential
14 record and clear the courtroom.

15 JUDGE ELLIOT: Very well.

16 (Whereupon, the hearing proceeded in confidential
17 session.)

18
19
20
21
22
23
24
25

1 O P E N S E S S I O N

2 CROSS-EXAMINATION

3 BY MS. SHANBERG:

4 Q. Good afternoon, Mr. Herrington. I am Stefani
5 Shanberg, and I represent the Amazon Respondents.

6 A. Good afternoon.

7 Q. I would like to first ask, you agree that there's
8 nothing materially different about your testimony in the
9 1379 investigation and that you are providing here in the
10 1380 investigation, right?

11 A. I would say it's consistent, outside of the
12 couple of things that I pointed out to Your Honor today.

13 Q. So can we agree that it's not materially
14 different, except to the extent that you're including
15 additional information relating to the '267 patent?

16 A. I wouldn't just say that. I mean, there was
17 what -- the things I talked about, about inventory, about
18 articles of commerce, everything that I testified to today
19 would be potentially something that is consistent, I think,
20 with the 1379 report.

21 Q. Okay. So let's look at what you told us when we
22 asked you this same question in your deposition.

23 A. Sure.

24 MS. SHANBERG: This is at 1380 deposition
25 transcript, 9, 18, through 10, 1, Mr. Sayres. 1380

1 deposition transcript, 9, 18, through 10, 1.

2 Thank you.

3 BY MS. SHANBERG:

4 Q. So in your deposition, sir, you were asked:

5 "Question: Is there anywhere your opinion would
6 differ between the 1379 investigation, the testimony you
7 gave in the 1379 investigation, and this one?

8 And you responded:

9 "Answer: Nothing that I can think of materially,
10 no."

11 Was that the question and was that your answer,
12 sir?

13 A. Yes. I think I was consistent in both
14 investigations.

15 Q. Okay. Thank you, sir. That will save us a lot
16 of time today.

17 You have been sitting in the courtroom this week
18 listening to Nokia's other witnesses testify, haven't you?

19 A. Yes.

20 Q. Okay. And you conducted multiple interviews to
21 inform your opinions, too, didn't you?

22 A. Yes.

23 MS. SHANBERG: Mr. Sayres, can you please bring
24 up the cross demonstratives?

25 BY MS. SHANBERG:

1 Q. You identified those discussions in your expert
2 report submitted in the 1379 investigation and also in this
3 investigation as seen here on the screen. Right, sir?

4 A. Yes.

5 Q. You did not interview anyone from Microsoft, did
6 you?

7 A. That's correct.

8 Q. And you did not interview anyone from Samsung
9 either?

10 A. That's correct.

11 Q. And we did not see Microsoft or Samsung testify
12 here this week, did we?

13 A. They testified in deposition, as I relayed. But,
14 yes, they didn't testify this week.

15 Q. Thank you, sir.

16 And no one from Microsoft or Samsung testified at
17 the 1379 evidentiary hearing either, right?

18 A. Not at the hearing, just in deposition.

19 Q. Okay. And you testified about a custom chipset
20 that Microsoft purchases from AMD for the Xbox devices,
21 correct?

22 A. Yes.

23 Q. All right. But you don't have an understanding
24 of what is done to customize these components, do you, sir?

25 A. I don't know exactly what is done. I know -- I

1 just know it's custom.

2 Q. The only evidence in your expert report relating
3 to a customized Xbox chipset was an online article, right?

4 A. There was an article that I cited to.

5 Q. Okay. And that's the article that we're looking
6 at on the screen here, sir?

7 A. Yes, it appears to be.

8 Q. It's also in your cross binder behind the first
9 tab, if you want to look at it.

10 A. Okay. I appreciate that.

11 Q. It's tiny in there, so we figured we would blow
12 it up for you.

13 A. Oh, goodness. Okay. Okay.

14 Q. This article is the only citation to evidence
15 within your expert reports relating to a custom Xbox
16 chipset, correct?

17 A. That may be the only one that I cited, but I have
18 certainly seen additional articles that talk about this.

19 Q. But you didn't cite any of them in your expert
20 report?

21 A. I don't believe I cited any of the other articles
22 that I saw that talked about this.

23 Q. Okay. And this was cited in the footnote that we
24 see here on this slide, right?

25 A. I believe so, yes.

1 Q. And this footnote and the URL for the article,
2 the title for the article, all confirm that this relates to
3 the Xbox One X, right?

4 A. That's correct.

5 Q. This article says it is from November 3rd, 2017,
6 doesn't it, sir?

7 A. That's what it says.

8 Q. All right. You also identified the Microsoft
9 domestic industry products in Exhibit 3 to your expert
10 report in this investigation, and that's what we see on
11 the screen here, right?

12 A. Yes.

13 Q. Turning back to the Microsoft domestic industry
14 products on the screen, the Xbox One X is not on the list of
15 domestic industry products in this investigation, is it?

16 A. That's correct. Although I have seen other
17 articles that would talk about these two.

18 Q. And you didn't cite any of those in your expert
19 report, right, sir?

20 A. I don't believe I did cite to them, but I've seen
21 them.

22 Q. But you realize that you actually have to
23 disclose your opinions in your expert reports, right, sir?

24 A. I absolutely try to disclose my opinions in my
25 expert report. Absolutely.

1 Q. Okay. Thank you, sir.

2 And you don't allege that there is customization
3 in the Surface domestic industry products, do you, sir?

4 A. Not in my expert report, although I believe there
5 may be, but nothing in my expert report. I would agree with
6 that.

7 Q. So all of a sudden, this didn't even make it into
8 your slides today, you believe there is customization in the
9 Microsoft Surface domestic industry products, sir?

10 A. I'll -- no, I won't say that. I've --

11 Q. Thank you.

12 A. I haven't heard it --

13 Q. Thank you, sir.

14 A. Fine.

15 Q. Is it nevertheless your opinion that both the
16 Microsoft Xbox products and the Surface products satisfy the
17 domestic industry requirement?

18 A. Can you repeat that question, please?

19 Q. Is it your opinion that both the Xbox products
20 and the Surface products satisfy the domestic industry
21 requirement?

22 A. Satisfy the domestic industry requirement from
23 an economic perspective?

24 Q. Correct.

25 A. I mean, they certainly do. I think based on

1 everything I've seen, that that is the correct domestic
2 industry product, are the Xbox products listed here and
3 the Surface products listed here.

4 Q. Okay. That wasn't my question, sir.

5 My question, sir, was that you believe that the
6 Xbox products satisfy the economic domestic industry
7 requirements, correct?

8 A. That I can use them to rely on the investments
9 associated with them in order to establish the economic
10 prong?

11 Q. It is your position, sir, the Microsoft Xbox DI
12 products and the Microsoft Surface DI products all satisfy
13 the economic prong of the domestic industry, right, sir?

14 A. That you can use them to -- it's my understanding
15 that they satisfy the technical prong and, therefore, I can
16 use them to calculate the investments associated with them
17 to satisfy the economic prong.

18 Q. I will take that as a yes.

19 A. Okay.

20 Q. All right. And you did not allocate investments
21 to any specific features or aspects of the domestic industry
22 products, right?

23 A. That's correct.

24 Q. Okay. And you don't have the data reflecting
25 what it costs for either Microsoft or Samsung to buy the

1 video encoding and decoding components, right?

2 A. That's correct. I don't think that would be
3 necessary.

4 Q. And you did not get data related to integrating
5 the video encoding or decoding components into the domestic
6 industry products either, right?

7 A. That's correct.

8 Q. So you don't offer an opinion as to what the
9 investments would be in the video encoding and decoding
10 components rather than the downstream products themselves,
11 do you?

12 A. That's correct.

13 MS. SHANBERG: All right. Thank you,
14 Mr. Herrington. I have no further questions.

15 JUDGE ELLIOT: Ms. Ducca, anything?

16 MS. DUCCA: Nothing from Staff, Your Honor.

17 JUDGE ELLIOT: Very well. Ms. Cieluch?

18 REDIRECT EXAMINATION

19 BY MS. CIELUCH:

20 Q. One quick question for you, Mr. Herrington.
21 Are there any downstream products in this
22 investigation?

23 A. No. I only know of the DI products, which are
24 the end user devices.

25 MS. CIELUCH: Thank you. That's all.

1 JUDGE ELLIOT: All right. Mr. Herrington, thank
2 you very much.

3 THE WITNESS: Thank you.

4 (The witness stood down.)

5 JUDGE ELLIOT: Let's go on the public record.

6 (Designation to open session modified per
7 parties.)

8 JUDGE ELLIOT: Who is next?

9 MR. SWAIN: Well, Your Honor, I believe
10 Respondents are next, as Complainants rest their
11 case-in-chief.

12 JUDGE ELLIOT: Very well.

13 MS. BREWER: Before Respondents call their first
14 witness, I just wanted to note that the entire cross of
15 Ms. Shanberg should have been on the public record.

16 JUDGE ELLIOT: Oh, okay.

17 MS. BREWER: So if we can just designate the
18 transcript as public.

19 JUDGE ELLIOT: Yes. Okay.

20 MR. SWAIN: Your Honor, I would ask that we get a
21 chance to review this before we redesignate it public this
22 evening. I'm sure we can work it out.

23 JUDGE ELLIOT: Okay. So let's do this then.

24 Let's keep it confidential for now. Meet and confer. If
25 you can reach agreement, we will designate whatever way.

1 MR. SWAIN: Excellent. Thank you, Your Honor.

2 MS. CIELUCH: And, Your Honor, if I may quickly,
3 I believe the objection discussion should be on the
4 confidential record. So we should also clear that up.

5 JUDGE ELLIOT: Meet and confer and see what you
6 can agree to.

7 MS. BREWER: Thank you, Your Honor.

8 As their first witness, Respondents call Dr. Eli
9 Saber.

10 Whereupon--

11 ELI SABER,
12 having been first duly sworn/affirmed, was examined and
13 testified as follows:

14

15 THE WITNESS: I do.

16 JUDGE ELLIOT: Have a seat.

17 DIRECT EXAMINATION

18 BY MS. BREWER:

19 Q. Good afternoon, Dr. Saber. Can you please
20 introduce yourself?

21 A. Yes. Eli Saber.

22 Q. Dr. Saber, did you prepare demonstratives to
23 assist with your testimony today?

24 A. I did.

25 Q. Is RDX-0098C the demonstratives you prepared?

1 A. Yes, it is.

2 Q. If we go to slide 2, what are you planning to
3 cover today?

4 A. I'm going to start by talking briefly about my
5 background.

6 I then am going to transition to the background
7 of the technology.

8 Then I am going to talk about the invalidity of
9 the '321 patent, followed by non-infringement of the '321
10 patent.

11 And, finally, I am going to end with the domestic
12 products, the domestic products and HP redesign, domestic
13 industry products and HP redesign.

14 Q. If we go to slide 3, what is your current
15 position?

16 A. I'm a professor in the Electrical and
17 Microelectronic Engineering Department at the Rochester
18 Institute of Technology, RIT. That's my primary
19 appointment. I have a second appointment in the Center
20 For Imaging Science at RIT.

21 Q. Could you just briefly summarize your educational
22 background?

23 A. Of course. I received a Bachelor of Science
24 degree in electrical and computer engineering from the
25 University of Buffalo in 1988. I received an MS and a Ph.D.

1 in '92 and '96 in electrical engineering from the University
2 of Rochester.

3 Q. Going to slide 4, what other experiences do you
4 have that are relevant to your testimony today?

5 A. Yes. I served as an adjunct faculty at RIT and
6 University of Rochester prior to joining RIT full-time in
7 2004.

8 I also established the digital video processing
9 laboratory at RIT. It is called the image video and
10 computer vision laboratory.

11 I also worked for Xerox Corporation for 16 years
12 from 1988, ending in 2004.

13 Q. On slide 5 you have a list here of awards and
14 publications. Which of these are relevant to your
15 testimony?

16 A. I received several awards from RIT for my
17 research work over the years. I have also served at various
18 conferences in various chair positions, most notably as
19 general chair and technical program chair for the largest
20 conferences in the Signal Processing Society.

21 MS. BREWER: Your Honor, Respondents offer
22 Dr. Saber as an expert in the field of video coding.

23 JUDGE ELLIOT: Very well.

24 BY MS. BREWER:

25 Q. Let's go to slide 6.

1 Do you understand that Nokia Respondents have
2 offered slightly different definitions of a person of
3 ordinary skill in the art for the '321 patent?

4 A. I do.

5 Q. If I refer to a person of skill in the art as a
6 POSITA, will you understand what I mean?

7 A. Yes, I will.

8 Q. At the time of the earliest priority of the '321
9 patent in 2002, did you meet both definitions of a POSITA?

10 A. Yes, I did.

11 Q. Are your opinions today based on the knowledge of
12 a POSITA according to these definitions?

13 A. I'm sorry?

14 Q. Are your opinions today based on the knowledge of
15 a POSITA according to these definitions?

16 A. Yes, they are.

17 Q. Do your opinions change based on the definition
18 applied?

19 A. No, they do not.

20 Q. If we go to slide 7, could you summarize your
21 opinions regarding the '321 patent?

22 A. Yes. When I read through the '321 specification,
23 it talked about the scalability. It also talked about
24 the droppings of sequences for bit rate constraints. It
25 mentions hierarchical numbering schemes and hierarchical

1 layers and series of layers.

2 And when I got to the claims and I read the two
3 asserted claims, claim 8 and 10, I was very surprised that
4 none of that appeared in the claims. The claims instead
5 claim normal, conventional, well-known video coding stuff
6 that dates back all the way to MPEG-1, as will become
7 evident from my slides.

8 So it is my opinion that MPEG-1 and Kim, another
9 reference that will come up shortly, both invalidates the
10 claims.

11 It is also my opinion that the accused standards
12 work the same way as MPEG-1 and do not infringe the claims.

13 And, finally, as you will see from later in my
14 slides, if MPEG-1 does not invalidate the claims, then there
15 is no infringement, as it will become evident from the
16 slides later in this presentation.

17 Q. So just to potentially put a finer point on it, I
18 notice that you're going to be addressing invalidity before
19 non-infringement. Why is that?

20 A. Because I will be addressing non-infringement
21 afterwards, and that's based on Nokia's allegations for
22 infringement.

23 Q. If we go to slide 8, what are you going to
24 discuss next?

25 A. I am going to talk about the background of the

1 technology.

2 Q. So let's start with that. Going to slide 9, can
3 you generally describe the subject matter of the '321
4 patent?

5 A. Yes. The '321 patent is about grouping of image
6 frames in video coding. And it was -- the inventor is
7 Dr. Hannuksela.

8 Q. Were you here for Dr. Kia's testimony yesterday?

9 A. Yes, I was.

10 Q. Dr. Kia testified that the '321 patent relates to
11 random access. Do you agree?

12 A. No, I do not agree with that.

13 Q. Before we get into why, can you explain what
14 random access is?

15 A. Yes. Absolutely.

16 So random access would be the ability for you to
17 access at a certain point in a video sequence and start
18 decoding from that point forward in that sequence.

19 Q. If we go to slide 10, I believe you have an
20 illustration related to random access.

21 Can you explain what is reflected here?

22 A. Yes. Absolutely.

23 You see here on this slide I have illustrated
24 30 frames of video, which is a single second in a practical
25 video for 30 frames. And I have illustrated all the frames

1 being an I-frame or intra-frame, so they are all coded
2 independently from each other in this particular
3 illustration such as you would see in a motion JPEG or
4 moving JPEG-type compression.

5 So all the frames are essentially independent and
6 can be coded, you know, just by accessing any frame at any
7 moment notice.

8 Q. So was there an advantage to this approach?

9 A. The advantage is you can access that particular
10 sequence at any point in these frames, any frames. If I
11 wanted to decode frame 19, I will just decompress it and
12 view it.

13 Q. Was there a drawback to this approach for video
14 sequences?

15 A. Yes. The price you pay for this is a reduction
16 in compression efficiency. This will be less -- you know,
17 it will be less compression efficient.

18 Q. If we go to slide 11, you have a second sequence
19 here. What is reflected in this second sequence?

20 A. The second sequence also reflects 1 second of
21 video, 30 frames. And as you can see in this sequence,
22 I have inserted an I-frame at the very beginning of the
23 sequence and then a series of predicted P-frames are all
24 interdependent on each other, all the way back to the
25 I-frame, so they are all coded in a residual manner all the

1 way back to the I-frame.

2 Q. So what is the benefit of this approach in the
3 second sequence?

4 A. The benefit of this approach is you gain
5 significant compression efficiency, because you're coding
6 the residual between the predicted frames, so you're coding
7 the difference between the frames instead of the entire
8 frame.

9 Q. And how does this affect random access?

10 A. Well, in this particular case, you can only
11 random access at frame I0. So, for instance, if you wanted
12 to decode frame 19 in this particular sequence, the second
13 one on the screen, you would need to start at I0, followed
14 by P1, followed by P2, all the way until you reach P19.

15 Q. If we go to slide 12, you have a third sequence
16 of frames. What is reflected in this third sequence?

17 A. In the third sequence I have basically inserted a
18 series of I-frames in the middle of the sequence, as you can
19 see at location 4, 10, 17, 22, and 27, to allow essentially
20 for random access in this particular third sequence.

21 Q. So here if the decoder wanted to start a P19,
22 what would it need to do?

23 A. You would only need to have to go to I17, so you
24 would decode I17 first, and then P18 and then P19.

25 Q. And if I understand this correctly, this allows

1 greater random access but you still have compression
2 efficiency. Did I get that right?

3 A. That's correct. This provides a good compromise
4 between random access. You can random access in this case
5 at the four or five locations within a second. You pay a
6 small price in compression efficiency because you have five
7 I-frames instead of a single one or six I-frames instead of
8 a single one.

9 Q. In this sequence can the decoder start decoding
10 at every single frame?

11 A. No, it cannot. It can only start at the I-frames
12 that I have illustrated here on this screen.

13 Q. So does the concept of random access require the
14 ability to start the decoding process at every frame?

15 A. No, it does not.

16 Q. Let's turn back to the patent. If we could go to
17 slide 13.

18 You testified earlier that the '321 patent is not
19 about random access, right?

20 A. That is correct.

21 Q. So what problem was the '321 patent trying to
22 solve?

23 A. Well, as you can see from the excerpts there on
24 the screen and you are reading through the specification,
25 the patent is about scalability and about the ability that

1 you can drop sub-sequences without -- when you have bit rate
2 constraints, you can drop certain sub-sequences and still
3 transmit or stream the video.

4 Q. If we go to slide 14, at a high level, what is
5 the way in which the '321 patent proposes to address
6 scaleability?

7 A. It offers a numbering scheme with hierarchical
8 layers. If you look at Figure 2, which is the excerpt right
9 there in the middle of the screen, you can see in Figure 2
10 that there are three layers; you have the intra layer, the
11 base layer, and the enhancement layers. And you also have
12 frames at different layers with interdependencies
13 highlighted there by the arrows in the figure.

14 So that's why you have a numbering scheme with
15 the hierarchical layer that I just described.

16 Q. Turning to slide 15, does the patent talk about
17 random access?

18 A. The patent mentions random access as an advantage
19 of the invention, but it's not the invention.

20 Q. If we go to slide 16, what are the claims that
21 Nokia has asserted?

22 A. Nokia has asserted claims 8 and 10 of the '321
23 patent.

24 Q. Are there any differences between the asserted
25 claims?

1 A. Yes. The first one, claim 8, is a method claim.
2 And claim 10 is an apparatus video decoder claim that has
3 processor, memory, and computer program code.

4 Q. And how about the rest of the claim elements
5 here?

6 A. Yes. The rest of the language is essentially the
7 same. As you can see from the highlights that I provided
8 there on the screen, you can see the red, the green, the
9 yellow, and the purple text is essentially the same.

10 Q. While we have this language on the screen, is
11 there anything special about the processor memory in
12 claim 10?

13 A. No, there isn't. These are just regular items
14 that we would find readily available.

15 Q. Let's move to slide 17.

16 Dr. Kia said that the claims relate to random
17 access. Do you agree?

18 A. No, I do not agree with that.

19 Q. Why not?

20 A. Well, random access is not contained in the
21 claims. You can see here I provided a sequence of
22 20 seconds of video on the screen at 30 frames a second,
23 which is the practical rate that you would capture video at.
24 And I have only inserted one I-frame at the very beginning
25 of that sequence, so you have essentially an I-frame

1 followed by a series of P-frames.

2 This would satisfy the claim language of claim
3 number 8.

4 Q. Does this example provide for random access?

5 A. Absolutely, it does not, because you have
6 20 seconds of video. And as you will see later from my
7 presentation, MPEG-1 recommends two frames per second for
8 random access.

9 So in this case we have 20 seconds of video and a
10 single I-frame. So you can only access the sequence at the
11 very beginning.

12 Q. And just to make absolutely sure we're clear, the
13 '321 patent and random access are not the same thing?

14 A. That is correct.

15 Q. Let's go to slide 18.

16 If the claims don't relate to hierarchical
17 numbering scheme, and they don't relate to random access,
18 what do the claims relate to?

19 A. Well, in my opinion, they relate to well-known
20 conventional or routine video decoding stuff. As you will
21 see from my presentations, when I talk -- from my later
22 slide when I talk about MPEG-1 and the Kim reference,
23 there's just one known routine, video decoding stuff.

24 Q. Is there anything about the order or combination
25 of the elements of the claims that is inventive?

1 A. No, there's not.

2 Q. Do the claims provide any improvements to the
3 field of computer video decoding?

4 A. No, they do not.

5 Q. Why is that?

6 A. Well, there isn't anything there in the claims
7 that hasn't been published already for several years, as
8 you will see dating back all the way to MPEG-1, which was
9 published almost a decade before this.

10 Q. If we go back to the concept of random access,
11 was that known prior to the '321 patent?

12 A. Absolutely. It will become very clear from my
13 slides, when we start talking about MPEG-1, that random
14 access was described as an essential feature of the
15 standard.

16 Q. Did you prepare a timeline to help discuss the
17 history of random access?

18 A. Yes, I did.

19 Q. Okay. So let's go to slide 19 with your
20 timeline. And where would you like to start?

21 A. I would like to start with MPEG-1, which was
22 published in August 1993 and is highlighted there on the
23 screen.

24 Q. If we go to slide 20, what is MPEG-1?

25 A. MPEG-1 is a video coding standard that was

1 developed by the Motion Picture Expert Group. And you can
2 see from the highlights on the screen, it is essentially
3 developed as a, you know, common format standard to compress
4 and handle compressed and decompressed video.

5 Q. We have heard you mention MPEG-1 in the context
6 of random access multiple times already today.

7 A. Yes, I did.

8 Q. So can you specifically tell us what it is that
9 MPEG-1 had to say about random access?

10 A. Absolutely.

11 So if you look at the middle of this screen, I
12 have captured an excerpt there from MPEG-1 directly from the
13 specification, and I have highlighted in that excerpt where
14 MPEG talks about random access.

15 So you can see MPEG has identified random access
16 as an essential feature of the standard, described it as
17 it requires any picture to be coded -- to be decoded in a
18 limited amount of time.

19 And at the last highlight that you see there in
20 that excerpt, it discussed that spacing of -- recommended
21 a spacing of two random access points, two I-pictures per
22 second, to essentially have a practical -- you know,
23 practical, you know, view or practical situation for random
24 access.

25 Q. If we go to slide 21, how did MPEG-1 implement

1 random access?

2 A. MPEG-1 did so by using a closed group of
3 pictures.

4 So at this point forward I'm just going to refer
5 to the group of pictures as a GOP or a G-O-P. And it will
6 be -- it means a group of pictures.

7 At the top excerpt at the screen you notice it
8 defines a group of pictures as a series of one or more coded
9 pictures intended to assist with random access.

10 And in the middle of the screen it defines a
11 closed GOP, which is essentially a group of pictures where
12 the frames within that group do not depend on anything prior
13 or after that group.

14 Q. If we go back to your timeline on slide 22, were
15 there other standards that came after MPEG-1?

16 A. Yes. MPEG-2 came shortly after MPEG-1 in 1995.

17 Q. Did MPEG-2 include random access?

18 A. Yes. It adopted the structure from MPEG-1
19 directly in the standard as is commonly done when you go
20 from standard to standard.

21 Q. Is that reflected here on slide 23?

22 A. Yes, it is. And it will become apparent for my
23 MPEG-1 slides coming up later on.

24 Q. If we move to slide 24, are there any submissions
25 and proposals related to random access leading up to the

1 H.264 standard that you would like to discuss?

2 A. Yes. I would like to discuss the Sony proposal
3 that's highlighted there on the screen, VCEG-053, followed
4 by three JVT proposals in that chronological order that you
5 see there on the screen all in purple.

6 Q. All right. If we go to slide 25, can you
7 describe specifically what in VCEG-053 you want to address?

8 A. Yes. VCEG-053, as you see, is a proposal
9 submitted by Sony Corporation, Sony engineers. And the
10 left side of the screen, when you look at the excerpt there,
11 it's -- the title is A Tool to Support Random Access.

12 On the right side of the screen, at the top
13 right, they provide an introduction. And you can see from
14 my highlights it states clearly that H.26L, which is a prior
15 standard to H.264, did not fulfill the random access
16 functionality.

17 And for that, to have random access in H.264,
18 they proposed to utilize the MPEG-1 and MPEG-2 GOP structure
19 that we talked about a moment ago to accomplish random
20 access.

21 You notice in the advantages they listed random
22 access functionality as something they would like to have in
23 this standard. And they confirmed that MPEG-1 and MPEG-2
24 has done this successfully, because you see from the bottom
25 in their conclusion, the GOP player in the MPEG-1 and 2 is

1 well tested and confirmed, so they would like to have that
2 GOP structure adopted into the H.264 standard that's being
3 developed.

4 Q. Going to slide 26, were there other proposals
5 after the Sony proposal that you would like to discuss?

6 A. Yes. As I mentioned earlier, I would like to
7 discuss the three JVT proposals that came after the Sony
8 proposal.

9 Q. So turning to slide 27, what is the first
10 proposal you want to discuss?

11 A. It's the JVT-B041, which, as you can see from
12 the left side of the screen, it's got the title, Simple
13 Definition of GOP for Random Access. It was put together
14 by Dr. Hannuksela from Nokia.

15 If you look at the left side of the screen it
16 clearly describes in the summary, it proposes a simple
17 modification into the slice header syntax.

18 I want to really clearly highlight that. That's
19 a slice header syntax.

20 On the right side of the screen, at the top
21 excerpt there that you see under Previous Work, you notice
22 they cited the prior proposal from Sony. You see VCEG-053,
23 that was -- and they -- Dr. Hannuksela clearly cited that
24 this was proposed as a GOP layer. This was the Sony
25 proposal.

1 What he noted is the proposal syntax did not
2 follow the current syntax that is being developed for the
3 H.264 standard and proposed essentially a straightforward
4 modification to try to address the syntax for the new
5 standard but not the functionality. And that's important to
6 distinguish between the two.

7 Q. Going to slide 28, what was the next proposal you
8 wanted to talk about?

9 A. The next proposal was the B109. As you can see
10 from the title it says Random Access and Time Information.
11 I want to point your attention to the authors. So the first
12 author that you see there is Dr. Hannuksela from Nokia.

13 The remaining two authors do not work for Nokia,
14 are not Nokia engineers. And you notice at the bottom it
15 says a syntax breakout group, which I will come back to that
16 in a few minutes.

17 The summary, you notice it says the output of the
18 breakout group which got the mandate to design the syntax
19 for the random access feature proposed that -- that was
20 initially proposed by Sony that they would like incorporated
21 into H.264.

22 Q. And if we look at the right side of this slide,
23 can you explain the terminology that was proposed instead
24 of using GOP?

25 A. Yes. So they proposed the use -- on the right

1 side, you see from my highlights there, the instantaneous
2 decoder refresh, which I will refer to from now on as IDR.
3 That's a terminology they wanted to utilize for random
4 access, where you can see clearly that is defined as no data
5 prior to the random access position is referred to in the
6 decoding process.

7 So it is essentially the same structure from
8 MPEG-1, GOP, but just a different syntax.

9 Q. Let's go to slide 29.

10 What is the next proposal you want to discuss?

11 A. The next proposal is a C083 proposal. And you
12 can see there at the bottom, which I highlighted in yellow
13 on the left side of the screen, you can see in that proposal
14 it says there is no technical change compared to the prior
15 two proposals that I just discussed. This proposal recapped
16 the prior proposal and then essentially proposed a new
17 syntax to be utilized in H.264.

18 I just want to clearly stress, it wasn't the
19 function. They adopted the same function from the MPEG-1
20 GOP. Just wanted to address the syntax.

21 Q. Let's go to slide 30. Did random access
22 eventually get implemented into H.264?

23 A. Yes. Random access was adopted in H.264 based on
24 the MPEG GOP structure we have been talking about for the
25 last four proposals.

1 Q. And what was the terminology that was used in
2 H.264?

3 A. The terminology that I just mentioned, the IDR
4 terminology.

5 Q. Based on your review of all the proposals, how
6 would you summarize the implementation for random access
7 in H.264?

8 A. So as you can see from the proposals and the
9 chronology that has been proposed, Sony engineers proposed
10 the idea of random access to be imported from MPEG-1 and 2
11 into the new standard H.264.

12 The JVT proposals that followed after that
13 addressed the syntax in order to fit in the H.264 standard.
14 And then, but adopted the functionality from MPEG-1 and 2,
15 which was well tested, well confirmed. And they wanted to
16 have random access into the new standard.

17 Q. Let's go to slide 31.

18 I want to talk about the timing of the filings
19 related to the '321 patent.

20 When were the parent applications for the '321
21 patent filed in relation to the H.264 standard?

22 A. As you can see from the timeline at the bottom of
23 the screen, highlighted in green, those were filed prior to
24 the H.264 standard.

25 Q. And what invention did the parent applications

1 relate to?

2 A. They related to the scalability and the
3 hierarchical layering and the numbering scheme that I just
4 discussed earlier -- you know, that I discussed earlier in
5 my slides.

6 Q. When H.264 was finalized, did it include the
7 hierarchical numbering scheme described in the patent
8 application?

9 A. No, it did not.

10 Q. What did Nokia do after the H.264 standard was
11 finalized?

12 A. They filed the new application for the '321
13 patent that we are discussing here today.

14 Q. How did the '321 patent compare to the parent
15 applications?

16 A. It did not -- as I mentioned earlier from the
17 claims, it did not claim the hierarchical numbering scheme
18 and scalability stuff that we discussed earlier. It was
19 just claimed, routine, well-known video coding stuff that
20 you will see well established with MPEG-1.

21 Q. Was there any difference in the specification?

22 A. The specification was exactly the same.

23 Q. So it was only the claims that were different?

24 A. That is correct. Only the claims that were
25 different. The specification. In my understanding. Is

1 exactly the same.

2 Q. Let's go to slide 32.

3 What is the next thing you want to discuss?

4 A. The next thing I want to discuss is the
5 invalidity, invalidity of the '321 patent.

6 Q. As an initial point, what is your opinion as to
7 whether claims 8 and 10 of the '321 patent are valid?

8 A. They are invalid in view of MPEG-1 and Kim. I
9 have obviously been talking about MPEG-1 quite a bit. So
10 they are invalid in view of MPEG-1 and Kim. That will
11 become evident from my slides.

12 Q. Let's go to slide 33 and start with MPEG-1.

13 Does MPEG-1 qualify as prior art to the '321
14 patent?

15 A. Absolutely. You can see from the date of 1993,
16 that was a decade -- almost a decade before the 2002 time
17 frame that we have been talking about.

18 Q. Turning to slide 34, I'd like to get into a bit
19 more detail about MPEG-1.

20 You previously testified that MPEG-1 describes
21 GOPs.

22 Does MPEG-1 provide an illustration of a closed
23 GOP?

24 A. You can see there at the top of the screen, it's
25 an excerpt directly from MPEG-1 specification.

1 It describes a closed GOP. And you can see this
2 is a typical example of a closed GOP. And it's Figure D.18A
3 directly from the standard specification.

4 Q. Can you explain what a decoder receives when it
5 receives an MPEG-1 video sequence as shown here on the lower
6 part of this slide?

7 A. Yes. The decoder would receive the sequence
8 header information first, followed by the GOP header,
9 followed by the frames in the GOP, and then followed by
10 the next GOP header, and then the frames in that GOP, and
11 et cetera, moving on. And the assumption here in this
12 slide is these GOPs are closed GOPs.

13 Q. Let's go to slide 35.

14 Can you break down the information that is
15 included in GOP 1?

16 A. Yes. So you would have the GOP 1 header first,
17 followed by the frames that are included in that closed GOP
18 in decoding order or bitstream order.

19 Q. For GOP 1, how did you create the frames shown
20 here on this slide?

21 A. So if you look at the top of the screen, the
22 excerpt directly from MPEG-1, you notice they provide a
23 typical example, and they provided the frames in display
24 order, the way you would display them on the screen for a
25 viewer to follow correctly.

1 The frames that are in blue in the middle of the
2 screen that you see there are the exact same frames except
3 they are in decoding order. This is the way the decoder
4 would receive them in order to be able to decode them
5 properly and display them to the screen.

6 Q. Let's go to slide 36.

7 Can you describe what information is provided as
8 part of the GOP header?

9 A. Yes. So slide 36, as you see here, the relevant
10 information for this case is what we call -- what is called
11 the closed_gop flag, which is a 1 bit flag set to 0 if the
12 GOP is open and set to 1 if the GOP is closed.

13 Q. What would the value of the flag be if -- for
14 GOP 1?

15 A. Assuming GOP 1 is a closed GOP, which is -- it is
16 in this illustration, the value of the closed_gop flag would
17 be set to 1.

18 Q. Looking now at frame I0, what information is
19 included as part of that frame?

20 A. The relevant information for this case would be
21 the temporal_reference, which is a 10-bit integer number.

22 Q. And what does the temporal_reference tell you?

23 A. The temporal_reference provides the order of the
24 frames in display order. So it provides a numbering of the
25 frames in display order, so if you look at the top excerpt

1 on the screen, that closed group that you see there, the
2 temporal_reference would be the 0, 1, 2, 3. Those are the
3 numbers in display order.

4 Q. So we have talked about GOP 1.

5 Turning to slide 37, what information would be
6 provided as part of GOP 2?

7 A. It would be the same information.

8 Q. All right. Let's go to slide 38.

9 How is the numbering for the temporal_reference
10 determined for GOP 2?

11 A. So as you can see there in the middle of the
12 screen, that is a direct excerpt from MPEG-1. You can see
13 the temporal reference, they clearly state it is a 10-bit
14 unassigned integer number. And you can see for the earliest
15 picture in display order in each group of pictures, that
16 temporal_reference is reset to 0.

17 Q. Now that we have some additional background on
18 MPEG-1, let's take a look at the claims. Let's go to
19 slide 39, starting with preamble of claim 8.

20 Does MPEG-1 disclose a method for decoding a
21 compressed video sequence?

22 A. Yes. You can see from the middle of the screen,
23 the purpose of MPEG was obviously to address compressing and
24 decompressing video sequences. You can see from the bottom
25 excerpt on this screen it talks about the scope and it

1 specifies the decoding process to essentially decode
2 compressed video.

3 Q. So does MPEG-1 teach limitations 8a, the preamble
4 of the '321 patent?

5 A. Yes, it does.

6 Q. Let's turn to slide 40 and look at the preamble
7 and structural limitations of claim 10.

8 Does MPEG-1 disclose a video decoder?

9 A. Well, you can see from Figure 4, which provide a
10 block diagram, and you can see the citation of the figure
11 states "Basic video decoder block diagram." So yes, it
12 discloses a video decoder.

13 Q. What platforms can MPEG-1 decoders be used with?

14 A. Personal computers and workstation displays.

15 Q. Would it have been obvious to a POSITA that
16 an MPEG-1 video decoder would include the structural
17 limitations of 10a?

18 A. Yes, it would.

19 Q. Turning to slide 44, why would it have been
20 obvious?

21 A. Well, as you can see here, a POSITA would have
22 known about examples of MPEG-1 decoders. On the screen here
23 in front of you, what I illustrated is a specific decoder.
24 You can see chip number CL480PC. And that's an MPEG-1
25 system decoder for personal computers.

1 Below that top excerpt there you can see a block
2 diagram of the decoder. And when you look at that block
3 diagram carefully you can see a CPU there, which is a
4 processor. You can see DRAM, which is obviously memory.
5 And when you drop down below, towards the bottom you can see
6 the microcode for the CPU is stored in DRAM. So it has a
7 processor, it's got RAM, and it's got code.

8 Q. Does MPEG-1 teach limitation 10a, the preamble
9 and structural limitations of the '321 patent?

10 A. Yes, it does.

11 Q. All right. Let's go to slide 48.2 and the
12 limitation that requires decoding an indication of a first
13 image frame of an independent sequence.

14 First, does MPEG-1 disclose an independent
15 sequence?

16 A. Yes. As we discussed earlier, you can see the
17 closed GOP which is an excerpt directly from MPEG. That is
18 an independent sequence because the frames within that
19 sequence don't depend on anything prior or after that
20 particular sequence.

21 Q. Moving to slide 43, does MPEG-1 disclose an
22 indication of the first image frame and decoding order of
23 the independent sequence?

24 A. Yes, it does. The closed_gop flag that we have
25 been talking about, which is the 1 bit flag, when that flag

1 is set to 1, it indicates basically the start of -- it
2 indicates an independent sequence and it points to the first
3 frame in decoding order of that independent sequence, which
4 in this case would be I0.

5 Q. Is the closed_gop flag decoded from the video
6 sequence?

7 A. Yes. It is decoded from the video sequence from
8 the bitstream.

9 Q. If the closed_gop flag is in the GOP headers, how
10 does that indicate a specific frame that is the first image
11 frame in an independent sequence?

12 A. Well, when you decode the closed_gop flag, which
13 is set to 1, the very next frame in decoding order that we
14 have been discussing here would be -- you know, would be the
15 first frame, basically, in decoding order.

16 Q. So does MPEG-1 teach limitations 8b and 10b?

17 A. Yes, it does.

18 Q. Moving to slide 44, let's take a look at the next
19 limitation.

20 Does MPEG-1 disclose starting the decoding of the
21 video sequence from the first frame of the independent
22 sequence?

23 A. Yes, it does. So you can see at the top of the
24 screen I have highlighted an excerpt directly from MPEG-1.
25 You notice it says "If playback begins from a random point

1 in the bitstream, the decoder should discard all bits until
2 a group of pictures start code is found," which then it will
3 start decoding, so it will get the closed_gop flag and will
4 start decoding that particular sequence.

5 Q. So does MPEG-1 teach limitations 8c and 10c?

6 A. Yes, it does.

7 Q. Let's go to slide 45 and turn to the limitation
8 related to decoding identifier values.

9 What identifier values does MPEG-1 teach?

10 A. Well, MPEG-1 teaches a temporal_reference, as I
11 referred to earlier, which is -- as you can see from the
12 excerpt at the top of the screen, it's a 10-bit unsigned
13 integer that is incremented by one, and it identifies
14 basically the frames in display order.

15 Q. So is that a numbering scheme?

16 A. That is a numbering scheme.

17 Q. Does MPEG-1 teach decoding the temporal_reference
18 values?

19 A. Yes. The temporal_reference values would be
20 decoded from the bitstream.

21 Q. So does MPEG-1 teach limitations 8d and 10d?

22 A. Yes, it does.

23 Q. Let's look at slide 46 and turn to the limitation
24 related to resetting the identifier value.

25 What does MPEG-1 say about resetting the

1 temporal_reference?

2 A. Well, that same excerpt I showed earlier is again
3 here on this screen. But in this case I highlighted the
4 relevant part, so you can see where it says, for the
5 temporal_reference, for the earliest picture in display
6 order in each group of pictures, the temporal_reference is
7 reset to 0.

8 Q. According to the claims, what has to perform the
9 resetting step?

10 A. The decoder.

11 Q. Can you explain how the decoder operates to
12 implement this resetting in MPEG-1?

13 A. Yes. So the reset value would be set by the
14 encoder and sent into the bitstream. The decoder would
15 decode the reset value from the bitstream and set a local
16 variable to 0 and would start incrementing that local
17 variable as it is decoding the frames in display order.

18 Q. Is this operation by the MPEG-1 decoder
19 sufficient to meet the resetting step?

20 A. Yes, it is.

21 Q. What evidence are you relying on for that
22 opinion?

23 A. I'm relying on the specification for the '321
24 patent that we have been discussing.

25 Q. If we go to slide 47, what does the specification

1 have to say?

2 A. So as you can see, this is an excerpt directly
3 from the '321 patent, and you see the citation at the
4 bottom. The word "reset" that you see there that is
5 highlighted on the screen is only mentioned once in the
6 specification outside of the claims. And it's only
7 mentioned in the context of the encoder.

8 Q. How does that align with the disclosure in
9 MPEG-1?

10 A. It's exactly the same.

11 Q. Let's go to slide 48. Let's say the claims
12 require the decoder to do more than read the reset value as
13 stored in the bitstream.

14 In that situation would MPEG-1 still disclose the
15 resetting limitation?

16 A. Yes, it would.

17 Q. Can you explain your opinion?

18 A. Yes. It would be obvious for the decoder, when
19 it decodes the closed_gop flag which is set to 1, it would
20 recognize that the next frame in decoding order is the first
21 frame. It will set the temporal_reference at that point to
22 0 and would start incrementing as it's decoding the frames
23 and putting it out in display order.

24 Q. Moving to slide 49, one of the other requirements
25 of this limitation is that the identifier value is reset for

1 the first image in decoding order, right?

2 A. That is correct.

3 Q. And I think you have said that the
4 temporal_reference is reset for the first image frame in
5 display order. Do I have that right?

6 A. Yes, you have that correctly.

7 Q. So how does resetting the temporal_reference meet
8 the claim limitation?

9 A. Well, as you can see, I put that example back
10 from MPEG-1 at the bottom of the screen. You can see this
11 is a typical example, and this is a closed group. The order
12 of the frames is in display order. The order of the frames
13 above in blue is in decoding order.

14 So it's the -- so the first frame in decoding
15 order is the first frame in display order. And that's what
16 gets reset to 0.

17 Q. So does MPEG-1 teach limitations 8e and 10e?

18 A. Yes, it does.

19 Q. In your opinion, are claims 8 and 10 invalid in
20 view of MPEG-1?

21 A. They are.

22 Q. Does Nokia have any response to your analysis of
23 MPEG-1 under D.18a?

24 A. No, they do not.

25 Q. If we go to slide 50, what do you understand is

1 Nokia's argument that MPEG-1 does not invalidate the claims?

2 A. Nokia's argument relies on a second embodiment in
3 MPEG-1, which is embodiment D.18b that you see there on the
4 screen highlighted. So I want to just point the attention
5 that you have D.18a on top and D.18b below it, so you can
6 see the difference.

7 So Nokia's argument relies on D.18b and basically
8 argues that the first frame in decoding order is -- which we
9 highlighted there in red is not the first frame in display
10 order.

11 Q. Are D.18a and D.18b the same embodiment?

12 A. No. They are separate embodiments, as I just
13 mentioned.

14 Q. What is your response to Nokia pointing to this
15 independent embodiment in D.18b?

16 A. So you can see from the bottom of the screen
17 there I highlighted the second, that D.18b embodiment, as
18 MPEG-1 states. It's a less typical example of a closed
19 group and it's essentially not relevant to my analysis.
20 I relied on the embodiment D.18a.

21 Q. In all of your years of experience in video
22 coding, have you ever seen an instance of a closed GOP using
23 the approach that Nokia is highlighting?

24 A. Not to my knowledge.

25 Q. So --

1 A. Not that I can recall. I'm sorry.

2 Q. So other than talking about the separate
3 embodiment in D.18b, does Nokia have any answer to your
4 analysis that MPEG-1 meets the claim limitations?

5 A. No, they do not.

6 Q. Let's go to slide 51. What is the implication of
7 Nokia's argument?

8 A. Well, Nokia argues, you know, MPEG-1 does not
9 invalidate the claims because it does not perform the claim
10 steps every single time it decodes an indication of a first
11 frame.

12 Q. Can you walk us through this illustration to
13 explain what you're saying?

14 A. Yes. You can see here I have illustrated an
15 incoming bitstream. And to make it easy, I have put three
16 GOPs.

17 GOP 1 is based on D.18a, the closed GOP, D.18a
18 embodiment; GOP 2 is also based on D.18a; however, GOP 3
19 is based on D.18b.

20 And you can see there from that illustration, so
21 for a first GOP you have the decode and reset. For the
22 second GOP, the decode and reset. For the first -- third
23 GOP, the D.18b, you have the decode but not reset.

24 Q. So is it your understanding under Nokia's
25 argument that for each independent sequence the limitations

1 of the asserted claims would need to be met?

2 A. Yes.

3 Q. Do you believe that Nokia's interpretation is
4 correct in that the steps of the claims have to be performed
5 for each indication of a first frame?

6 A. No, I do not.

7 Q. Is there anything in the claim language that
8 requires this?

9 A. No, there isn't.

10 Q. Your Honor, it's almost 4:45. I am about to go
11 into a new reference. Would you like us to just pause here?

12 JUDGE ELLIOT: Yes. That's fine. Okay. So we
13 will break for the day.

14 Dr. Saber, during our break please don't discuss
15 your testimony with anyone. You can talk about other
16 things, but not your testimony.

17 THE WITNESS: Absolutely, sir. You have my word
18 on it.

19 JUDGE ELLIOT: Thank you.

20 And, again, if anything happens overnight, please
21 tell me in the morning.

22 And also, I want to see what the time is tomorrow
23 morning. If anyone is time keeping, let me know tomorrow
24 morning. Let me know how you're doing in terms of progress.
25 Okay?

1 (Whereupon, at 4:43 p.m., the hearing recessed,
2 to reconvene at 9:00 a.m. on Wednesday, September 11, 2024.)
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Heritage Reporting Corporation
(202) 628-4888

1	C O N T E N T S					
2						
3	WITNESS	DIRECT	CROSS	REDIRECT	RECROSS	STAFF
4	KEITH BOTNER	333	344			
5	MICHAEL	354	369	393	397	389
6	AKEMANN		381			
7	PIERRE MOULIN	414	510			
8	RYAN	544	563	570		
9	HERRINGTON					
10	ELI SABER	572				
11	AFTERNOON SESSION:			465		
12	CONFIDENTIAL SESSIONS					
13			357 - 365			
14			374 - 385			
15			389 - 391			
16			395 - 399			
17			434 - 434			
18			438 - 438			
19			464 - 467			
20			480 - 481			
21			500 - 501			
22			508 - 509			
23			538 - 543			
24			548 - 562			
25						

1 COMPLAINANTS' ADMITTED TRIAL EXHIBITS (DAY 1 - 9/9/24)
2 ADMITTED DURING PREHEARING CONFERENCE
3 CX-0013
4 CX-0021
5 CX-0022
6 CX-0023
7 CX-0024
8 CX-0027C
9 CX-0028
10 CX-0029
11 CX-0030
12 CX-0031
13 CX-0032
14 CX-0033
15 CX-0034
16 CX-0035
17 CX-0036
18 CX-0037
19 CX-0038
20 CX-0039
21 CX-0040
22 CX-0041
23 CX-0042
24 CX-0043
25 CX-0044

Heritage Reporting Corporation
(202) 628-4888

1 CX-0045
2 CX-0046
3 CX-0047
4 CX-0048
5 CX-0052
6 CX-0053
7 CX-0054
8 CX-0055
9 CX-0056
10 CX-0057
11 CX-0058
12 CX-0059
13 CX-0060
14 CX-0061
15 CX-0062
16 CX-0063
17 CX-0064
18 CX-0065
19 CX-0066
20 CX-0067
21 CX-0068
22 CX-0069
23 CX-0070
24 CX-0071
25 CX-0072

Heritage Reporting Corporation
(202) 628-4888

1 CX-0073
2 CX-0074
3 CX-0081
4 CX-0098C
5 CX-0099C
6 CX-0100C
7 CX-0101C
8 CX-0102C
9 CX-0103C
10 CX-0104C
11 CX-0105C
12 CX-0106C
13 CX-0107C
14 CX-0108C
15 CX-0109C
16 CX-0110C
17 CX-0111C
18 CX-0112C
19 CX-0113C
20 CX-0114C
21 CX-0115C
22 CX-0116C
23 CX-0117C
24 CX-0118C
25 CX-0119C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0120C
2 CX-0121C
3 CX-0122C
4 CX-0123C
5 CX-0124C
6 CX-0125C
7 CX-0126C
8 CX-0127C
9 CX-0128C
10 CX-0129C
11 CX-0130C
12 CX-0131C
13 CX-0132C
14 CX-0133C
15 CX-0134C
16 CX-0135C
17 CX-0136C
18 CX-0137C
19 CX-0138C
20 CX-0139C
21 CX-0140C
22 CX-0141C
23 CX-0142C
24 CX-0143C
25 CX-0144C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0145C
2 CX-0146C
3 CX-0147C
4 CX-0148C
5 CX-0149C
6 CX-0150C
7 CX-0151C
8 CX-0152C
9 CX-0153C
10 CX-0154C
11 CX-0155C
12 CX-0156C
13 CX-0157C
14 CX-0158C
15 CX-0159C
16 CX-0160C
17 CX-0161C
18 CX-0162C
19 CX-0163C
20 CX-0164C
21 CX-0165C
22 CX-0166C
23 CX-0167C
24 CX-0168C
25 CX-0169C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0170C
2 CX-0171C
3 CX-0172C
4 CX-0173C
5 CX-0174C
6 CX-0175C
7 CX-0176C
8 CX-0177C
9 CX-0178C
10 CX-0179C
11 CX-0180C
12 CX-0181C
13 CX-0182C
14 CX-0183C
15 CX-0184C
16 CX-0185C
17 CX-0186C
18 CX-0187C
19 CX-0188C
20 CX-0189C
21 CX-0190C
22 CX-0191C
23 CX-0192C
24 CX-0193C
25 CX-0194C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0195C
2 CX-0196C
3 CX-0197C
4 CX-0198C
5 CX-0199C
6 CX-0200C
7 CX-0201C
8 CX-0202C
9 CX-0203
10 CX-0204
11 CX-0205
12 CX-0206
13 CX-0207
14 CX-0208
15 CX-0209
16 CX-0210
17 CX-0211
18 CX-0212
19 CX-0213
20 CX-0214
21 CX-0215
22 CX-0216
23 CX-0217
24 CX-0218C
25 CX-0219C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0220C
2 CX-0221C
3 CX-0222C
4 CX-0227C
5 CX-0228C
6 CX-0229C
7 CX-0230C
8 CX-0231C
9 CX-0232C
10 CX-0233C
11 CX-0234C
12 CX-0235C
13 CX-0236C
14 CX-0237C
15 CX-0238C
16 CX-0239C
17 CX-0240C
18 CX-0241C
19 CX-0242C
20 CX-0243C
21 CX-0244C
22 CX-0245C
23 CX-0246C
24 CX-0247C
25 CX-0248C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0249C
2 CX-0250C
3 CX-0251C
4 CX-0252C
5 CX-0253C
6 CX-0254C
7 CX-0255C
8 CX-0256C
9 CX-0257C
10 CX-0258C
11 CX-0259C
12 CX-0260C
13 CX-0261C
14 CX-0262C
15 CX-0263C
16 CX-0276C
17 CX-0278C
18 CX-0290C
19 CX-0298C
20 CX-0304C
21 CX-0305C
22 CX-0306C
23 CX-0307C
24 CX-0308C
25 CX-0309C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0310C
2 CX-0311C
3 CX-0312C
4 CX-0313C
5 CX-0314C
6 CX-0315C
7 CX-0316C
8 CX-0317C
9 CX-0318C
10 CX-0319C
11 CX-0322C
12 CX-0323C
13 CX-0324C
14 CX-0325C
15 CX-0326C
16 CX-0327C
17 CX-0328C
18 CX-0329C
19 CX-0330C
20 CX-0331C
21 CX-0332C
22 CX-0333C
23 CX-0334C
24 CX-0335C
25 CX-0336C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0337C
2 CX-0338C
3 CX-0339C
4 CX-0340C
5 CX-0341C
6 CX-0342
7 CX-0343
8 CX-0344
9 CX-0345
10 CX-0346
11 CX-0347
12 CX-0348
13 CX-0349C
14 CX-0350C
15 CX-0351C
16 CX-0352C
17 CX-0353C
18 CX-0354C
19 CX-0355C
20 CX-0356C
21 CX-0357C
22 CX-0358C
23 CX-0359C
24 CX-0360C
25 CX-0361C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0362C
2 CX-0363C
3 CX-0364C
4 CX-0365C
5 CX-0366C
6 CX-0367C
7 CX-0368C
8 CX-0369C
9 CX-0370C
10 CX-0371C
11 CX-0372C
12 CX-0373C
13 CX-0374C
14 CX-0375C
15 CX-0376C
16 CX-0377C
17 CX-0378C
18 CX-0379C
19 CX-0380C
20 CX-0381C
21 CX-0382C
22 CX-0383C
23 CX-0384C
24 CX-0395C
25 CX-0396C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0397C
2 CX-0398C
3 CX-0399
4 CX-0400
5 CX-0401
6 CX-0402
7 CX-0403
8 CX-0404
9 CX-0405
10 CX-0406
11 CX-0407
12 CX-0408
13 CX-0409
14 CX-0410
15 CX-0411
16 CX-0412
17 CX-0413
18 CX-0414
19 CX-0415
20 CX-0416
21 CX-0418
22 CX-0419
23 CX-0420
24 CX-0421
25 CX-0422

Heritage Reporting Corporation
(202) 628-4888

1 CX-0423
2 CX-0424
3 CX-0440C
4 CX-0441C
5 CX-0442C
6 CX-0443C
7 CX-0444C
8 CX-0445
9 CX-0446
10 CX-0447
11 CX-0448
12 CX-0449
13 CX-0450
14 CX-0451
15 CX-0452
16 CX-0453
17 CX-0454
18 CX-0455
19 CX-0456
20 CX-0457
21 CX-0458
22 CX-0469
23 CX-0470
24 CX-0471
25 CX-0472

Heritage Reporting Corporation
(202) 628-4888

1 CX-0473
2 CX-0474
3 CX-0475
4 CX-0476
5 CX-0477
6 CX-0478
7 CX-0479
8 CX-0480C
9 CX-0481
10 CX-0482
11 CX-0483
12 CX-0484C
13 CX-0485
14 CX-0486
15 CX-0487
16 CX-0488
17 CX-0489
18 CX-0490
19 CX-0491
20 CX-0492
21 CX-0493
22 CX-0494
23 CX-0495
24 CX-0496
25 CX-0497

Heritage Reporting Corporation
(202) 628-4888

1 CX-0498
2 CX-0499
3 CX-0500
4 CX-0501
5 CX-0502
6 CX-0503C
7 CX-0504
8 CX-0505
9 CX-0507
10 CX-0508
11 CX-0509
12 CX-0510
13 CX-0511
14 CX-0512
15 CX-0513
16 CX-0514
17 CX-0516C
18 CX-0517C
19 CX-0518C
20 CX-0519C
21 CX-0520C
22 CX-0521C
23 CX-0523C
24 CX-0524C
25 CX-0525C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0526C
2 CX-0527C
3 CX-0528C
4 CX-0529C
5 CX-0530C
6 CX-0531C
7 CX-0532C
8 CX-0533C
9 CX-0534
10 CX-0535
11 CX-0579
12 CX-0580
13 CX-0581
14 CX-0582
15 CX-0583
16 CX-0584
17 CX-0591C
18 CX-0593
19 CX-0594
20 CX-0595
21 CX-0596
22 CX-0597
23 CX-0598
24 CX-0599
25 CX-0600

Heritage Reporting Corporation
(202) 628-4888

1 CX-0601
2 CX-0602
3 CX-0603
4 CX-0604
5 CX-0605
6 CX-0606
7 CX-0607
8 CX-0608
9 CX-0609
10 CX-0610
11 CX-0611
12 CX-0612
13 CX-0613
14 CX-0614
15 CX-0615
16 CX-0616
17 CX-0617
18 CX-0618
19 CX-0619
20 CX-0620
21 CX-0621
22 CX-0622
23 CX-0624C
24 CX-0625C
25 CX-0626C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0627C
2 CX-0628C
3 CX-0629C
4 CX-0630C
5 CX-0631C
6 CX-0632C
7 CX-0633C
8 CX-0634C
9 CX-0635C
10 CX-0636C
11 CX-0637C
12 CX-0638C
13 CX-0639C
14 CX-0640C
15 CX-0641C
16 CX-0642C
17 CX-0643C
18 CX-0644C
19 CX-0645C
20 CX-0646C
21 CX-0647C
22 CX-0648C
23 CX-0649C
24 CX-0650C
25 CX-0651C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0652C
2 CX-0653C
3 CX-0654C
4 CX-0655C
5 CX-0656C
6 CX-0657C
7 CX-0658C
8 CX-0659C
9 CX-0660C
10 CX-0661C
11 CX-0662C
12 CX-0663C
13 CX-0664C
14 CX-0665C
15 CX-0666C
16 CX-0667C
17 CX-0668C
18 CX-0669C
19 CX-0670C
20 CX-0671C
21 CX-0672C
22 CX-0673C
23 CX-0674C
24 CX-0675C
25 CX-0676C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0677C
2 CX-0678C
3 CX-0679C
4 CX-0680C
5 CX-0681C
6 CX-0682C
7 CX-0683C
8 CX-0684C
9 CX-0685C
10 CX-0686C
11 CX-0687C
12 CX-0688C
13 CX-0689C
14 CX-0690C
15 CX-0691C
16 CX-0692C
17 CX-0693C
18 CX-0694C
19 CX-0695C
20 CX-0696C
21 CX-0697C
22 CX-0698C
23 CX-0699C
24 CX-0700C
25 CX-0701C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0702C
2 CX-0703C
3 CX-0704C
4 CX-0705C
5 CX-0706C
6 CX-0707C
7 CX-0708C
8 CX-0709C
9 CX-0710C
10 CX-0711C
11 CX-0712C
12 CX-0713C
13 CX-0714C
14 CX-0715C
15 CX-0716C
16 CX-0717C
17 CX-0718C
18 CX-0719C
19 CX-0720C
20 CX-0721C
21 CX-0722C
22 CX-0723C
23 CX-0724C
24 CX-0725C
25 CX-0726C

Heritage Reporting Corporation
(202) 628-4888

1 CX-0727C
2 CX-0728C
3 CX-0729C
4 CX-0730C
5 CX-0731C
6 CX-0732C
7 CX-0733C
8 CX-0734C
9 CX-0735
10 CX-0736
11 CX-0737
12 CX-0738
13 CX-0739
14 CX-0740C
15 CX-0741C
16 CX-0742C
17 CX-0743
18 CX-0744
19 CX-0745
20 CX-0746
21 CX-0747C
22 CX-0748
23 CX-0749
24 CX-0750
25 CX-0751

Heritage Reporting Corporation
(202) 628-4888

1 CX-0752
2 CX-0753C
3 CX-0754
4 CX-0755
5 CX-0756
6 CX-0757
7 CX-0758
8 CX-0759
9 CX-0760C
10 CX-0761
11 CX-0762
12 CX-0763
13 CX-0764
14 CX-0765
15 CX-0766
16 CX-0767
17 CX-0768
18 CX-0769C
19 CX-0770
20 CX-0771
21 CX-0772
22 CX-0773
23 CX-0774
24 CX-0775
25 CX-0776

Heritage Reporting Corporation
(202) 628-4888

1 CX-0777
2 CX-0778
3 CX-0779
4 CX-0780
5 CX-0781C
6 CX-0782
7 CX-0783
8 CX-0784
9 CX-0785
10 CX-0786
11 CX-0787C
12 CX-0788
13 CX-0789
14 CX-0790
15 CX-0791
16 CX-0792
17 CX-0793
18 CX-0794C
19 CX-0795C
20 CX-0796
21 CX-0797
22 CX-0798
23 CX-0799
24 CX-0800
25 CX-0801

Heritage Reporting Corporation
(202) 628-4888

1 CX-0802
2 CX-0803
3 CX-0804
4 CX-0805
5 CX-0806
6 CX-0807
7 CX-0808C
8 CX-0809
9 CX-0810
10 CX-0811
11 CX-0812
12 CX-0813
13 CX-0814
14 CX-0815C
15 CX-0816C
16 CX-0817C
17 CX-0818
18 CX-0819
19 CX-0820
20 CX-0821C
21 CX-0822C
22 CX-0823C
23 CX-0824C
24 CX-0825
25 CX-0826

Heritage Reporting Corporation
(202) 628-4888

1 CX-0827
2 CX-0828
3 CX-0829
4 CX-0830
5 CX-0831C
6 CX-0832
7 CX-0833
8 CX-0834
9 CX-0835
10 CX-0836
11 CX-0837
12 CX-0838
13 CX-0839
14 CX-0840
15 CX-0841
16 CX-0842
17 CX-0843
18 CX-0844
19 CX-0845
20 CX-0846
21 CX-0847
22 CX-0848C
23 CX-0849
24 CX-0850
25 CX-0851

Heritage Reporting Corporation
(202) 628-4888

1 CX-0852
2 CX-0853
3 CX-0854
4 CX-0855
5 CX-0856
6 CX-0857
7 CX-0858
8 CX-0859
9 CX-0860
10 CX-0861
11 CX-0862
12 CX-0863
13 CX-0864
14 CX-0865
15 CX-0866
16 CX-0867
17 CX-0868
18 CX-0869
19 CX-0870
20 CX-0871
21 CX-0872
22 CX-0873
23 CX-0874
24 CX-0875
25 CX-0876

Heritage Reporting Corporation
(202) 628-4888

1 CX-0877
2 CX-0878
3 CX-0879
4 CX-0880
5 CX-0881
6 CX-0882
7 CX-0883
8 CX-0884
9 CX-0885
10 CX-0886
11 CX-0887
12 CX-0888
13 CX-0889
14 CX-0890
15 CX-0891
16 CX-0892
17 CX-0893
18 CX-0894
19 CX-0895
20 CX-0896
21 CX-0897
22 CX-0898
23 CX-0899
24 CX-0900
25 CX-0901

Heritage Reporting Corporation
(202) 628-4888

1 CX-0902
2 CX-0903
3 CX-0904
4 CX-0905
5 CX-0906
6 CX-0907
7 CX-0908
8 CX-0909
9 CX-0910
10 CX-0911
11 CX-0912
12 CX-0913
13 CX-0914
14 CX-0915
15 CX-0916
16 CX-0917
17 CX-0918
18 CX-0919
19 CX-0920
20 CX-0921
21 CX-0922
22 CX-0923
23 CX-0924
24 CX-0925
25 CX-0926

Heritage Reporting Corporation
(202) 628-4888

1 CX-0927
2 CX-0928
3 CX-0929
4 CX-0930
5 CX-0931
6 CX-0932
7 CX-0933
8 CX-0934
9 CX-0935
10 CX-0936
11 CX-0937
12 CX-0938
13 CX-0939
14 CX-0940
15 CX-0941
16 CX-0942
17 CX-0943
18 CX-0944
19 CX-0945
20 CX-0946
21 CX-0947
22 CX-0948
23 CX-0949
24 CX-0950
25 CX-0951

Heritage Reporting Corporation
(202) 628-4888

1 CX-0952
2 CX-0953
3 CX-0954
4 CX-0955
5 CX-0956
6 CX-0957
7 CX-0958
8 CX-0959
9 CX-0960
10 CX-0961
11 CX-0962
12 CX-0963
13 CX-0964
14 CX-0965
15 CX-0966
16 CX-0967C
17 CX-0968C
18 CX-0969C
19 CX-0970C
20 CX-0971C
21 CX-0972C
22 CX-0973C
23 CX-0974
24 CX-0975
25 CX-0976

Heritage Reporting Corporation
(202) 628-4888

1 CX-0977C
2 CX-0978C
3 CX-0979C
4 CX-0980C
5 CX-0981C
6 CX-0982C
7 CX-0983C
8 CX-0984C
9 CX-0985
10 CX-0986
11 CX-0987
12 CX-0988
13 CX-0989
14 CX-0990
15 CX-0991
16 CX-0992
17 CX-0993
18 CX-0996
19 CX-0998
20 CX-0999
21 CX-1000
22 CX-1002
23 CX-1003
24 CX-1004
25 CX-1005

Heritage Reporting Corporation
(202) 628-4888

1 CX-1006
2 CX-1009
3 CX-1010
4 CX-1011
5 CX-1012
6 CX-1013
7 CX-1014
8 CX-1017C
9 CX-1018C
10 CX-1019C
11 CX-1020C
12 CX-1021
13 CX-1022
14 CX-1023
15 CX-1024
16 CX-1025
17 CX-1026
18 CX-1027
19 CX-1028
20 CX-1029
21 CX-1030
22 CX-1031
23 CX-1032
24 CX-1033
25 CX-1034

Heritage Reporting Corporation
(202) 628-4888

1 CX-1035
2 CX-1036
3 CX-1037
4 CX-1038
5 CX-1039
6 CX-1040
7 CX-1041
8 CX-1042
9 CX-1043
10 CX-1044
11 CX-1045
12 CX-1046
13 CX-1047
14 CX-1048
15 CX-1050
16 CX-1051
17 CX-1052
18 CX-1053
19 CX-1054
20 CX-1055
21 CX-1056
22 CX-1057
23 CX-1058
24 CX-1059
25 CX-1060

Heritage Reporting Corporation
(202) 628-4888

1 CX-1061
2 CX-1062
3 CX-1063
4 CX-1064
5 CX-1065
6 CX-1067
7 CX-1068
8 CX-1069
9 CX-1070
10 CX-1071
11 CX-1072
12 CX-1073
13 CX-1074
14 CX-1093
15 CX-1094
16 CX-1095
17 CX-1096
18 CX-1097
19 CX-1098
20 CX-1099
21 CX-1100
22 CX-1101
23 CX-1102
24 CX-1103
25 CX-1104

Heritage Reporting Corporation
(202) 628-4888

1 CX-1105
2 CX-1106
3 CX-1107
4 CX-1108
5 CX-1109
6 CX-1110
7 CX-1111
8 CX-1112
9 CX-1113
10 CX-1114
11 CX-1115
12 CX-1116
13 CX-1117
14 CX-1118
15 CX-1119
16 CX-1120
17 CX-1121
18 CX-1122
19 CX-1123
20 CX-1124
21 CX-1125
22 CX-1126
23 CX-1127
24 CX-1128
25 CX-1129

Heritage Reporting Corporation
(202) 628-4888

1 CX-1130
2 CX-1131
3 CX-1132
4 CX-1133
5 CX-1134
6 CX-1135
7 CX-1136
8 CX-1137
9 CX-1138
10 CX-1139
11 CX-1140
12 CX-1141
13 CX-1142
14 CX-1143
15 CX-1144
16 CX-1145
17 CX-1146
18 CX-1147
19 CX-1148
20 CX-1149
21 CX-1150
22 CX-1151
23 CX-1152
24 CX-1153
25 CX-1154

Heritage Reporting Corporation
(202) 628-4888

1 CX-1155
2 CX-1156
3 CX-1157
4 CX-1158
5 CX-1159
6 CX-1160
7 CX-1161
8 CX-1162
9 CX-1163
10 CX-1164
11 CX-1165
12 CX-1166
13 CX-1167
14 CX-1168
15 CX-1169
16 CX-1170
17 CX-1171
18 CX-1172
19 CX-1173
20 CX-1174
21 CX-1175
22 CX-1176
23 CX-1177
24 CX-1178
25 CX-1179

Heritage Reporting Corporation
(202) 628-4888

1 CX-1180
2 CX-1181
3 CX-1182
4 CX-1183
5 CX-1184
6 CX-1185
7 CX-1186
8 CX-1187
9 CX-1188
10 CX-1189
11 CX-1190
12 CX-1191
13 CX-1192
14 CX-1193
15 CX-1194
16 CX-1195
17 CX-1196
18 CX-1197
19 CX-1198
20 CX-1199
21 CX-1200
22 CX-1201
23 CX-1202
24 CX-1203
25 CX-1204

Heritage Reporting Corporation
(202) 628-4888

1 CX-1205
2 CX-1206
3 CX-1207
4 CX-1208
5 CX-1209
6 CX-1210
7 CX-1211
8 CX-1212
9 CX-1213
10 CX-1214
11 CX-1215
12 CX-1216
13 CX-1217
14 CX-1218
15 CX-1219
16 CX-1220
17 CX-1221
18 CX-1222
19 CX-1223
20 CX-1224
21 CX-1225
22 CX-1226
23 CX-1227
24 CX-1228
25 CX-1229

Heritage Reporting Corporation
(202) 628-4888

1 CX-1230
2 CX-1231
3 CX-1232
4 CX-1233
5 CX-1234
6 CX-1235
7 CX-1236
8 CX-1237
9 CX-1238
10 CX-1239
11 CX-1240
12 CX-1241
13 CX-1242
14 CX-1243
15 CX-1244
16 CX-1245
17 CX-1246
18 CX-1247
19 CX-1248
20 CX-1249
21 CX-1250
22 CX-1251
23 CX-1252
24 CX-1253
25 CX-1254

Heritage Reporting Corporation
(202) 628-4888

1 CX-1255
2 CX-1256
3 CX-1257
4 CX-1258
5 CX-1259
6 CX-1260
7 CX-1261
8 CX-1262
9 CX-1263
10 CX-1264
11 CX-1265
12 CX-1266
13 CX-1267
14 CX-1268
15 CX-1269
16 CX-1270
17 CX-1271
18 CX-1272
19 CX-1273
20 CX-1274
21 CX-1275
22 CX-1276
23 CX-1277
24 CX-1278
25 CX-1279

Heritage Reporting Corporation
(202) 628-4888

1 CX-1280
2 CX-1281
3 CX-1282
4 CX-1283
5 CX-1284
6 CX-1285
7 CX-1286
8 CX-1287
9 CX-1288
10 CX-1289
11 CX-1290
12 CX-1291
13 CX-1292
14 CX-1293
15 CX-1294
16 CX-1295
17 CX-1296
18 CX-1297
19 CX-1298
20 CX-1299
21 CX-1300
22 CX-1301
23 CX-1302
24 CX-1303
25 CX-1304

Heritage Reporting Corporation
(202) 628-4888

1 CX-1305
2 CX-1306
3 CX-1307
4 CX-1308
5 CX-1309
6 CX-1310
7 CX-1311
8 CX-1312
9 CX-1313
10 CX-1314
11 CX-1315
12 CX-1316
13 CX-1317
14 CX-1318
15 CX-1319
16 CX-1320
17 CX-1321
18 CX-1322
19 CX-1323
20 CX-1324
21 CX-1325
22 CX-1326
23 CX-1327
24 CX-1328
25 CX-1329

Heritage Reporting Corporation
(202) 628-4888

1 CX-1330
2 CX-1331
3 CX-1332
4 CX-1333
5 CX-1334
6 CX-1335
7 CX-1336
8 CX-1337
9 CX-1338
10 CX-1339
11 CX-1340
12 CX-1341
13 CX-1342
14 CX-1343
15 CX-1344
16 CX-1345
17 CX-1346
18 CX-1347
19 CX-1348
20 CX-1349
21 CX-1350
22 CX-1351
23 CX-1352
24 CX-1353
25 CX-1354

Heritage Reporting Corporation
(202) 628-4888

1 CX-1355
2 CX-1356
3 CX-1357
4 CX-1358
5 CX-1359
6 CX-1360
7 CX-1361
8 CX-1362
9 CX-1363
10 CX-1364
11 CX-1365
12 CX-1366
13 CX-1367
14 CX-1368
15 CX-1369
16 CX-1370
17 CX-1371
18 CX-1372
19 CX-1373
20 CX-1374
21 CX-1375
22 CX-1376
23 CX-1377
24 CX-1378
25 CX-1379

Heritage Reporting Corporation
(202) 628-4888

1 CX-1380
2 CX-1381
3 CX-1382
4 CX-1383
5 CX-1384
6 CX-1385
7 CX-1386
8 CX-1387
9 CX-1388
10 CX-1389
11 CX-1390
12 CX-1391
13 CX-1392
14 CX-1393
15 CX-1394
16 CX-1395
17 CX-1396
18 CX-1397
19 CX-1398
20 CX-1399
21 CX-1400
22 CX-1401
23 CX-1402
24 CX-1403
25 CX-1404

Heritage Reporting Corporation
(202) 628-4888

1 CX-1405
2 CX-1406
3 CX-1407
4 CX-1408
5 CX-1409
6 CX-1410
7 CX-1411
8 CX-1412
9 CX-1413
10 CX-1414
11 CX-1415
12 CX-1416
13 CX-1417
14 CX-1418
15 CX-1419
16 CX-1420
17 CX-1421
18 CX-1422
19 CX-1423
20 CX-1424
21 CX-1425
22 CX-1426
23 CX-1427
24 CX-1428
25 CX-1429

Heritage Reporting Corporation
(202) 628-4888

1 CX-1430
2 CX-1431
3 CX-1432
4 CX-1433
5 CX-1434
6 CX-1435
7 CX-1436
8 CX-1437
9 CX-1438
10 CX-1439
11 CX-1440
12 CX-1441
13 CX-1442
14 CX-1443
15 CX-1444
16 CX-1445
17 CX-1446
18 CX-1447
19 CX-1448
20 CX-1449
21 CX-1450
22 CX-1451
23 CX-1452
24 CX-1453
25 CX-1454

Heritage Reporting Corporation
(202) 628-4888

1 CX-1455
2 CX-1456
3 CX-1457
4 CX-1458
5 CX-1459
6 CX-1460
7 CX-1461
8 CX-1462
9 CX-1463
10 CX-1464
11 CX-1465
12 CX-1466
13 CX-1467
14 CX-1468
15 CX-1469
16 CX-1470
17 CX-1471
18 CX-1472
19 CX-1473
20 CX-1474
21 CX-1475
22 CX-1476
23 CX-1477
24 CX-1478
25 CX-1479

Heritage Reporting Corporation
(202) 628-4888

1 CX-1480
2 CX-1481
3 CX-1482
4 CX-1483
5 CX-1484
6 CX-1485
7 CX-1486
8 CX-1487
9 CX-1488
10 CX-1489
11 CX-1490
12 CX-1491
13 CX-1492
14 CX-1493
15 CX-1494
16 CX-1495
17 CX-1496
18 CX-1497
19 CX-1498
20 CX-1499
21 CX-1500
22 CX-1501
23 CX-1502
24 CX-1503
25 CX-1504

Heritage Reporting Corporation
(202) 628-4888

1 CX-1505
2 CX-1506
3 CX-1507
4 CX-1508
5 CX-1509
6 CX-1510
7 CX-1511
8 CX-1512
9 CX-1513
10 CX-1514
11 CX-1515
12 CX-1516
13 CX-1517
14 CX-1518
15 CX-1519
16 CX-1520
17 CX-1521
18 CX-1522
19 CX-1523
20 CX-1524
21 CX-1525
22 CX-1526
23 CX-1527
24 CX-1528
25 CX-1529

Heritage Reporting Corporation
(202) 628-4888

1 CX-1530
2 CX-1531
3 CX-1532
4 CX-1533
5 CX-1534
6 CX-1535
7 CX-1536
8 CX-1537
9 CX-1538
10 CX-1539
11 CX-1540
12 CX-1541
13 CX-1542
14 CX-1543
15 CX-1544
16 CX-1545
17 CX-1546
18 CX-1547
19 CX-1548
20 CX-1549
21 CX-1550
22 CX-1551
23 CX-1552
24 CX-1553
25 CX-1554

Heritage Reporting Corporation
(202) 628-4888

1 CX-1555
2 CX-1556
3 CX-1557
4 CX-1558
5 CX-1559
6 CX-1560
7 CX-1561
8 CX-1562
9 CX-1563
10 CX-1564
11 CX-1565
12 CX-1566
13 CX-1567
14 CX-1568
15 CX-1569
16 CX-1570
17 CX-1571
18 CX-1572
19 CX-1573
20 CX-1574
21 CX-1575
22 CX-1576
23 CX-1577
24 CX-1578
25 CX-1579

Heritage Reporting Corporation
(202) 628-4888

1 CX-1580
2 CX-1581
3 CX-1582
4 CX-1583
5 CX-1584
6 CX-1585
7 CX-1586
8 CX-1587
9 CX-1588
10 CX-1589
11 CX-1590
12 CX-1591
13 CX-1592
14 CX-1593
15 CX-1594
16 CX-1595
17 CX-1596
18 CX-1597
19 CX-1598
20 CX-1599
21 CX-1601
22 CX-1608
23 CX-1609
24 CX-1611
25 CX-1612

Heritage Reporting Corporation
(202) 628-4888

1 CX-1624
2 CX-1625
3 CX-1626
4 CX-1627
5 CX-1630
6 CX-1633
7 CX-1635
8 CX-1636
9 CX-1637
10 CX-1638
11 CX-1639
12 CX-1640
13 CX-1641
14 CX-1642
15 CX-1643
16 CX-1644
17 CX-1647
18 CX-1648
19 CX-1651
20 CX-1652
21 CX-1659
22 CX-1661
23 CX-1663
24 CX-1664
25 CX-1665

Heritage Reporting Corporation
(202) 628-4888

1 CX-1666
2 CX-1669C
3 CX-1671C
4 CX-1672C
5 CX-1673C
6 CX-1674C
7 CX-1675C
8 CX-1676C
9 CX-1677C
10 CX-1678C
11 CX-1680C
12 CX-1681C
13 CX-1682C
14 CX-1684C
15 CX-1687C
16 CX-1688C
17 CX-1690C
18 CX-1692C
19 CX-1694C
20 CX-1696C
21 CX-1697C
22 CX-1698C
23 CX-1699C
24 CX-1700C
25 CX-1702C

Heritage Reporting Corporation
(202) 628-4888

1 CX-1704C
2 CX-1706C
3 CX-1708C
4 CX-1709C
5 CX-1710C
6 CX-1711C
7 CX-1714C
8 CX-1722C
9 CX-1723C
10 CX-1724C
11 CX-1725C
12 CX-1731
13 CX-1734
14 CX-1735
15 CX-1736
16 CX-1737
17 CX-1738
18 CX-1739
19 CX-1741
20 CX-1742
21 CX-1745C
22 CX-1746C
23 CX-1747C
24 CX-1748C
25 CX-1750C

Heritage Reporting Corporation
(202) 628-4888

1 CX-1751C
2 CX-1752C
3 CX-1753C
4 CX-1754C
5 CX-1755C
6 CX-1757C
7 CX-1758C
8 CX-1759C
9 CX-1760C
10 CX-1761C
11 CX-1762C
12 CX-1763C
13 CX-1764C
14 CX-1765C
15 CX-1766C
16 CX-1769C
17 CX-1770C
18 CX-1771C
19 CX-1772C
20 CX-1773C
21 CX-1774C
22 CX-1782C
23 CX-1783C
24 CX-1784C
25 CX-1785C

Heritage Reporting Corporation
(202) 628-4888

1 CX-1786C
2 CX-1787C
3 CX-1788C
4 CX-1789C
5 CX-1790C
6 CX-1791C
7 CX-1792C
8 CX-1793C
9 CX-1794C
10 CX-1795C
11 CX-1796C
12 CX-1797C
13 CX-1798C
14 CX-1799C
15 CX-1800C
16 CX-1801C
17 CX-1802C
18 CX-1803C
19 CX-1805
20 CX-1807
21 CX-1808C
22 CX-1809
23 CX-1810
24 CX-1811
25 CX-1812

Heritage Reporting Corporation
(202) 628-4888

1 CX-1813
2 CX-1814
3 CX-1815
4 CX-1816
5 CX-1817
6 CX-1818
7 CX-1819
8 CX-1820
9 CX-1821
10 CX-1822
11 CX-1823
12 CX-1824
13 CX-1825
14 CX-1826
15 CX-1827
16 CX-1828
17 CX-1829
18 CX-1830
19 CX-1831
20 CX-1832
21 CX-1833
22 CX-1834
23 CX-1835
24 CX-1836
25 CX-1837

Heritage Reporting Corporation
(202) 628-4888

1 CX-1838C
2 CX-1840
3 CX-1841
4 CX-1842
5 CX-1843
6 CX-1844
7 CX-1845
8 CX-1846
9 CX-1847C
10 CX-1848C
11 CX-1849C
12 CX-1850C
13 CX-1852C
14 CX-1853C
15 CX-1854C
16 CX-1855C
17 CX-1856C
18 CX-1857C
19 CX-1858C
20 CX-1859C
21 CX-1860C
22 CX-1861
23 CX-1862
24 CX-1863
25 CX-1864

Heritage Reporting Corporation
(202) 628-4888

1 CX-1865
2 CX-1866
3 CX-1867
4 CX-1868
5 CX-1869
6 CX-1870
7 CX-1871
8 CX-1872
9 CX-1873
10 CX-1874
11 CX-1875
12 CX-1876
13 CX-1877
14 CX-1878
15 CX-1879
16 CX-1881C
17 CX-1882C
18 CX-1883C
19 CX-1884C
20 CX-1885C
21 CX-1886C
22 CX-1887C
23 CX-1888C
24 CX-1889C
25 CX-1895C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2130C
2 CX-2131C
3 CX-2132C
4 CX-2133C
5 CX-2134C
6 CX-2135C
7 CX-2136C
8 CX-2137C
9 CX-2138
10 CX-2139
11 CX-2140
12 CX-2141
13 CX-2142
14 CX-2143
15 CX-2144
16 CX-2145
17 CX-2146
18 CX-2148
19 CX-2149
20 CX-2150
21 CX-2151
22 CX-2152
23 CX-2153
24 CX-2154
25 CX-2155

Heritage Reporting Corporation
(202) 628-4888

1 CX-2156
2 CX-2157
3 CX-2158
4 CX-2159
5 CX-2160
6 CX-2161
7 CX-2162
8 CX-2163C
9 CX-2164C
10 CX-2165C
11 CX-2166
12 CX-2167C
13 CX-2168C
14 CX-2169C
15 CX-2170C
16 CX-2171C
17 CX-2172C
18 CX-2173C
19 CX-2174C
20 CX-2175C
21 CX-2176C
22 CX-2177C
23 CX-2178C
24 CX-2179C
25 CX-2180C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2181C
2 CX-2182C
3 CX-2183C
4 CX-2184C
5 CX-2185C
6 CX-2186C
7 CX-2187C
8 CX-2188C
9 CX-2190C
10 CX-2191C
11 CX-2192C
12 CX-2193C
13 CX-2194C
14 CX-2195C
15 CX-2196C
16 CX-2197C
17 CX-2198C
18 CX-2199C
19 CX-2200C
20 CX-2201C
21 CX-2202C
22 CX-2203C
23 CX-2204C
24 CX-2205C
25 CX-2206C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2207C
2 CX-2208C
3 CX-2209C
4 CX-2211C
5 CX-2212C
6 CX-2213C
7 CX-2214C
8 CX-2215C
9 CX-2216C
10 CX-2217C
11 CX-2218C
12 CX-2219C
13 CX-2220C
14 CX-2221C
15 CX-2222C
16 CX-2223C
17 CX-2224C
18 CX-2225C
19 CX-2226C
20 CX-2227C
21 CX-2231C
22 CX-2232C
23 CX-2233
24 CX-2234
25 CX-2235

Heritage Reporting Corporation
(202) 628-4888

1 CX-2236
2 CX-2239
3 CX-2240
4 CX-2244
5 CX-2245C
6 CX-2246
7 CX-2247
8 CX-2248
9 CX-2249
10 CX-2250
11 CX-2251C
12 CX-2252C
13 CX-2253C
14 CX-2254C
15 CX-2255C
16 CX-2256C
17 CX-2258C
18 CX-2259C
19 CX-2260C
20 CX-2269C
21 CX-2270C
22 CX-2271C
23 CX-2272C
24 CX-2273C
25 CX-2274C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2275C
2 CX-2276C
3 CX-2277
4 CX-2278C
5 CX-2279C
6 CX-2280C
7 CX-2281C
8 CX-2283
9 CX-2284
10 CX-2291C
11 CX-2294C
12 CX-2295C
13 CX-2296C
14 CX-2297C
15 CX-2298C
16 CX-2299C
17 CX-2300C
18 CX-2301C
19 CX-2302C
20 CX-2303C
21 CX-2304C
22 CX-2305C
23 CX-2306C
24 CX-2307C
25 CX-2308C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2309C
2 CX-2310C
3 CX-2311C
4 CX-2312C
5 CX-2313C
6 CX-2314C
7 CX-2315C
8 CX-2316C
9 CX-2317C
10 CX-2318C
11 CX-2319C
12 CX-2320C
13 CX-2321C
14 CX-2322C
15 CX-2323C
16 CX-2324C
17 CX-2334C
18 CX-2368C
19 CX-2369C
20 CX-2370C
21 CX-2371C
22 CX-2374C
23 CX-2375C
24 CX-2376C
25 CX-2377C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2378C
2 CX-2379C
3 CX-2380C
4 CX-2383C
5 CX-2384C
6 CX-2385C
7 CX-2388C
8 CX-2389C
9 CX-2390C
10 CX-2391C
11 CX-2392C
12 CX-2394C
13 CX-2395C
14 CX-2396C
15 CX-2397C
16 CX-2410
17 CX-2411
18 CX-2412
19 CX-2413
20 CX-2414
21 CX-2415
22 CX-2416
23 CX-2417
24 CX-2418
25 CX-2420

Heritage Reporting Corporation
(202) 628-4888

1 CX-2421
2 CX-2422
3 CX-2423
4 CX-2424
5 CX-2425
6 CX-2426
7 CX-2427
8 CX-2428
9 CX-2429
10 CX-2430
11 CX-2431
12 CX-2432
13 CX-2433
14 CX-2434
15 CX-2435
16 CX-2436
17 CX-2437
18 CX-2438
19 CX-2439
20 CX-2440
21 CX-2441
22 CX-2442
23 CX-2443
24 CX-2444
25 CX-2445

Heritage Reporting Corporation
(202) 628-4888

1 CX-2446
2 CX-2447
3 CX-2448
4 CX-2449
5 CX-2450
6 CX-2451
7 CX-2452
8 CX-2453
9 CX-2454
10 CX-2455
11 CX-2456
12 CX-2457
13 CX-2458
14 CX-2459
15 CX-2460
16 CX-2461
17 CX-2462
18 CX-2463
19 CX-2464
20 CX-2465
21 CX-2466
22 CX-2467
23 CX-2468
24 CX-2469
25 CX-2470

Heritage Reporting Corporation
(202) 628-4888

1 CX-2471
2 CX-2472
3 CX-2473
4 CX-2474
5 CX-2475
6 CX-2476
7 CX-2477
8 CX-2478
9 CX-2479
10 CX-2480
11 CX-2481
12 CX-2482
13 CX-2483
14 CX-2484
15 CX-2485
16 CX-2486
17 CX-2487
18 CX-2488
19 CX-2489
20 CX-2490
21 CX-2491
22 CX-2492
23 CX-2493
24 CX-2494
25 CX-2495

Heritage Reporting Corporation
(202) 628-4888

1 CX-2496
2 CX-2497
3 CX-2498
4 CX-2499
5 CX-2500
6 CX-2501
7 CX-2502
8 CX-2503
9 CX-2504
10 CX-2505
11 CX-2506
12 CX-2507
13 CX-2508
14 CX-2509
15 CX-2510
16 CX-2511
17 CX-2512
18 CX-2513
19 CX-2514
20 CX-2515
21 CX-2516
22 CX-2517
23 CX-2518
24 CX-2519
25 CX-2520

Heritage Reporting Corporation
(202) 628-4888

1 CX-2521
2 CX-2522
3 CX-2523
4 CX-2524
5 CX-2525
6 CX-2526
7 CX-2527
8 CX-2528
9 CX-2529
10 CX-2530
11 CX-2531
12 CX-2532
13 CX-2533
14 CX-2534
15 CX-2535
16 CX-2536
17 CX-2537
18 CX-2538
19 CX-2539
20 CX-2540
21 CX-2541
22 CX-2542
23 CX-2543
24 CX-2544
25 CX-2545

Heritage Reporting Corporation
(202) 628-4888

1 CX-2546
2 CX-2547
3 CX-2548
4 CX-2549
5 CX-2550
6 CX-2551
7 CX-2552
8 CX-2553
9 CX-2554
10 CX-2555
11 CX-2556
12 CX-2557
13 CX-2558
14 CX-2559
15 CX-2560
16 CX-2561
17 CX-2562
18 CX-2563
19 CX-2564
20 CX-2565
21 CX-2566
22 CX-2567
23 CX-2568
24 CX-2569
25 CX-2570

Heritage Reporting Corporation
(202) 628-4888

1 CX-2571
2 CX-2572
3 CX-2573
4 CX-2574
5 CX-2575
6 CX-2576
7 CX-2577
8 CX-2578
9 CX-2579
10 CX-2580
11 CX-2581
12 CX-2582
13 CX-2583
14 CX-2584
15 CX-2585
16 CX-2586
17 CX-2587
18 CX-2588
19 CX-2589
20 CX-2590
21 CX-2591
22 CX-2592
23 CX-2593
24 CX-2594
25 CX-2595

Heritage Reporting Corporation
(202) 628-4888

1 CX-2596
2 CX-2597
3 CX-2598
4 CX-2599
5 CX-2600
6 CX-2601
7 CX-2602
8 CX-2603
9 CX-2604
10 CX-2605
11 CX-2606
12 CX-2607
13 CX-2608
14 CX-2609
15 CX-2610
16 CX-2611
17 CX-2612
18 CX-2613
19 CX-2614
20 CX-2615
21 CX-2616
22 CX-2617
23 CX-2618
24 CX-2620
25 CX-2621

Heritage Reporting Corporation
(202) 628-4888

1 CX-2622
2 CX-2623
3 CX-2624
4 CX-2625
5 CX-2626
6 CX-2627
7 CX-2628
8 CX-2629
9 CX-2630
10 CX-2631
11 CX-2632
12 CX-2633
13 CX-2634
14 CX-2635
15 CX-2636
16 CX-2637
17 CX-2638C
18 CX-2639C
19 CX-2640C
20 CX-2641C
21 CX-2642C
22 CX-2643C
23 CX-2644C
24 CX-2645C
25 CX-2647C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2654C
2 CX-2661C
3 CX-2662C
4 CX-2663C
5 CX-2664C
6 CX-2665C
7 CX-2666C
8 CX-2667C
9 CX-2668C
10 CX-2670C
11 CX-2671C
12 CX-2672C
13 CX-2673C
14 CX-2674C
15 CX-2680C
16 CX-2681C
17 CX-2682C
18 CX-2683C
19 CX-2684C
20 CX-2685C
21 CX-2686C
22 CX-2687C
23 CX-2688C
24 CX-2689C
25 CX-2690C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2691C
2 CX-2692C
3 CX-2693C
4 CX-2694C
5 CX-2695C
6 CX-2696C
7 CX-2697C
8 CX-2701C
9 CX-2702C
10 CX-2703C
11 CX-2704C
12 CX-2706C
13 CX-2708C
14 CX-2709C
15 CX-2710C
16 CX-2711C
17 CX-2713C
18 CX-2714C
19 CX-2722C
20 CX-2723C
21 CX-2727C
22 CX-2728C
23 CX-2731C
24 CX-2732C
25 CX-2733C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2734C
2 CX-2735C
3 CX-2736
4 CX-2737
5 CX-2738C
6 CX-2739C
7 CX-2740C
8 CX-2742
9 CX-2743
10 CX-2748
11 CX-2751
12 CX-2753
13 CX-2755
14 CX-2760
15 CX-2761
16 CX-2765
17 CX-2773
18 CX-2775
19 CX-2777C
20 CX-2778C
21 CX-2779
22 CX-2780
23 CX-2783
24 CX-2803
25 CX-2815

Heritage Reporting Corporation
(202) 628-4888

1 CX-2819
2 CX-2826
3 CX-2829
4 CX-2831C
5 CX-2832C
6 CX-2833
7 CX-2836C
8 CX-2840
9 CX-2841
10 CX-2842
11 CX-2843
12 CX-2847
13 CX-2860
14 CX-2861
15 CX-2862
16 CX-2863
17 CX-2864
18 CX-2865
19 CX-2866
20 CX-2867
21 CX-2868
22 CX-2869
23 CX-2870
24 CX-2871
25 CX-2872

Heritage Reporting Corporation
(202) 628-4888

1 CX-2873
2 CX-2874
3 CX-2875
4 CX-2876
5 CX-2877
6 CX-2878
7 CX-2879
8 CX-2886
9 CX-2887
10 CX-2888
11 CX-2889
12 CX-2890
13 CX-2891
14 CX-2892
15 CX-2893
16 CX-2894
17 CX-2895
18 CX-2898
19 CX-2904
20 CX-2905C
21 CX-2906 AMD C SOURCE CODE
22 CX-2907 MEDIATEK C SOURCE CODE
23 CX-2908 MEDIATEK C SOURCE CODE
24 CX-2909 MEDIATEK C SOURCE CODE
25 CX-2910 MEDIATEK C SOURCE CODE

Heritage Reporting Corporation
(202) 628-4888

1 CX-2911 MEDIATEK C SOURCE CODE
2 CX-2912 MEDIATEK C SOURCE CODE
3 CX-2913 AMD C SOURCE CODE
4 CX-2914 QUALCOMM C SOURCE CODE
5 CX-2915 AMD C SOURCE CODE
6 CX-2916 AMD C SOURCE CODE
7 CX-2917 AMLOGIC C SOURCE CODE
8 CX-2918 AMD C SOURCE CODE
9 CX-2919C
10 CX-2920C
11 CX-2921C
12 CX-2922 QUALCOMM C
13 CX-2923 QUALCOMM C
14 CX-2924C
15 CX-2925C
16 CX-2926
17 CX-2927
18 CX-2928
19 CX-2929
20 CX-2930
21 CX-2931
22 CX-2934
23 CX-2935
24 CX-2939C
25 CX-2940C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2941C
2 CX-2942C
3 CX-2943C
4 CX-2944C
5 CX-2945C
6 CX-2946C
7 CX-2947C
8 CX-2948C
9 CX-2949C
10 CX-2950C
11 CX-2951C
12 CX-2952C
13 CX-2953C
14 CX-2954C
15 CX-2955C
16 CX-2956C
17 CX-2957C
18 CX-2959C
19 CX-2962C
20 CX-2963C
21 CX-2964C
22 CX-2965C
23 CX-2968C
24 CX-2969C
25 CX-2970C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2971C
2 CX-2972C
3 CX-2973C
4 CX-2974C
5 CX-2975C
6 CX-2976C
7 CX-2977C
8 CX-2978C
9 CX-2979C
10 CX-2980C
11 CX-2981C
12 CX-2982C
13 CX-2983C
14 CX-2984C
15 CX-2985C
16 CX-2986C
17 CX-2987C
18 CX-2988C
19 CX-2989C
20 CX-2990C
21 CX-2991C
22 CX-2992C
23 CX-2993C
24 CX-2994C
25 CX-2995C

Heritage Reporting Corporation
(202) 628-4888

1 CX-2996C
2 CX-2997C
3 CX-2998C
4 CX-2999C
5 CX-3000C
6 CX-3001C
7 CX-3002C
8 CX-3003C
9 CX-3004C
10 CX-3005C
11 CX-3006C
12 CX-3007C
13 CX-3008C
14 CX-3009C
15 CX-3010C
16 CX-3011C
17 CX-3012C
18 CX-3013C
19 CX-3014C
20 CX-3015C
21 CX-3016C
22 CX-3017C
23 CX-3018C
24 CX-3019C
25 CX-3020C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3021C
2 CX-3022C
3 CX-3023C
4 CX-3024C
5 CX-3025C
6 CX-3026C
7 CX-3027C
8 CX-3028C
9 CX-3029C
10 CX-3033C
11 CX-3035C
12 CX-3039C
13 CX-3040C
14 CX-3042C
15 CX-3043C
16 CX-3045C
17 CX-3048C
18 CX-3053C
19 CX-3054C
20 CX-3055C
21 CX-3056C
22 CX-3057C
23 CX-3058C
24 CX-3059C
25 CX-3060C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3061C
2 CX-3062C
3 CX-3063C
4 CX-3064C
5 CX-3065C
6 CX-3066C
7 CX-3067C
8 CX-3068C
9 CX-3069C
10 CX-3070C
11 CX-3071C
12 CX-3072C
13 CX-3073C
14 CX-3074C
15 CX-3075C
16 CX-3076C
17 CX-3077C
18 CX-3078C
19 CX-3079C
20 CX-3080C
21 CX-3081C
22 CX-3082C
23 CX-3083C
24 CX-3084C
25 CX-3085C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3086C
2 CX-3087C
3 CX-3088C
4 CX-3089C
5 CX-3092C
6 CX-3093C
7 CX-3094C
8 CX-3096
9 CX-3099C
10 CX-3138C
11 CX-3140C
12 CX-3143C
13 CX-3156C
14 CX-3157C
15 CX-3158C
16 CX-3159C
17 CX-3160C
18 CX-3164C
19 CX-3165C
20 CX-3166C
21 CX-3167C
22 CX-3168C
23 CX-3211C
24 CX-3212C
25 CX-3213C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3216C
2 CX-3218C
3 CX-3220C
4 CX-3221C
5 CX-3222C
6 CX-3223C
7 CX-3225C
8 CX-3226C
9 CX-3233
10 CX-3234C
11 CX-3235C
12 CX-3236C
13 CX-3237C
14 CX-3240C
15 CX-3241C
16 CX-3242C
17 CX-3243C
18 CX-3244C
19 CX-3245C
20 CX-3246C
21 CX-3247C
22 CX-3248C
23 CX-3249C
24 CX-3250C
25 CX-3251C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3252C
2 CX-3253C
3 CX-3254C
4 CX-3255C
5 CX-3256C
6 CX-3257C
7 CX-3258C
8 CX-3259C
9 CX-3260C
10 CX-3261C
11 CX-3262C
12 CX-3263C
13 CX-3264C
14 CX-3265C
15 CX-3266C
16 CX-3267C
17 CX-3268C
18 CX-3269C
19 CX-3270C
20 CX-3271C
21 CX-3272C
22 CX-3273C
23 CX-3274C
24 CX-3275C
25 CX-3276C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3277C
2 CX-3278C
3 CX-3279C
4 CX-3280C
5 CX-3281C
6 CX-3282C
7 CX-3283C
8 CX-3284C
9 CX-3285C
10 CX-3286C
11 CX-3287C
12 CX-3288C
13 CX-3289C
14 CX-3290C
15 CX-3291C
16 CX-3292C
17 CX-3293C
18 CX-3294C
19 CX-3295C
20 CX-3296C
21 CX-3297C
22 CX-3298C
23 CX-3299C
24 CX-3300C
25 CX-3301C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3302C
2 CX-3303C
3 CX-3304C
4 CX-3305C
5 CX-3306C
6 CX-3307C
7 CX-3308C
8 CX-3309C
9 CX-3310C
10 CX-3311C
11 CX-3312C
12 CX-3313C
13 CX-3314C
14 CX-3315C
15 CX-3316C
16 CX-3317C
17 CX-3318C
18 CX-3319C
19 CX-3320C
20 CX-3321C
21 CX-3322C
22 CX-3323C
23 CX-3324C
24 CX-3325C
25 CX-3326C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3327C
2 CX-3328C
3 CX-3329C
4 CX-3330C
5 CX-3331C
6 CX-3332C
7 CX-3333C
8 CX-3334C
9 CX-3335C
10 CX-3336C
11 CX-3337C
12 CX-3338C
13 CX-3339C
14 CX-3340C
15 CX-3341C
16 CX-3342C
17 CX-3343C
18 CX-3344C
19 CX-3345C
20 CX-3346C
21 CX-3347C
22 CX-3348C
23 CX-3349C
24 CX-3350C
25 CX-3351C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3352C
2 CX-3353C
3 CX-3354C
4 CX-3355C
5 CX-3356C
6 CX-3357C
7 CX-3358C
8 CX-3359C
9 CX-3360C
10 CX-3361C
11 CX-3362C
12 CX-3363C
13 CX-3364C
14 CX-3365C
15 CX-3366C
16 CX-3367C
17 CX-3368C
18 CX-3369C
19 CX-3370C
20 CX-3371C
21 CX-3372C
22 CX-3373C
23 CX-3374C
24 CX-3375C
25 CX-3376C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3377C
2 CX-3378C
3 CX-3379C
4 CX-3380C
5 CX-3381C
6 CX-3382C
7 CX-3383C
8 CX-3384C
9 CX-3385C
10 CX-3386C
11 CX-3387C
12 CX-3388C
13 CX-3389C
14 CX-3390C
15 CX-3391C
16 CX-3392C
17 CX-3393C
18 CX-3394C
19 CX-3395C
20 CX-3396C
21 CX-3397C
22 CX-3398C
23 CX-3399C
24 CX-3400C
25 CX-3401C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3402C
2 CX-3403C
3 CX-3404C
4 CX-3405C
5 CX-3406C
6 CX-3407C
7 CX-3408C
8 CX-3409C
9 CX-3410C
10 CX-3411C
11 CX-3412C
12 CX-3413C
13 CX-3414C
14 CX-3415C
15 CX-3416C
16 CX-3417C
17 CX-3418C
18 CX-3419C
19 CX-3420C
20 CX-3421C
21 CX-3422C
22 CX-3423C
23 CX-3424C
24 CX-3425C
25 CX-3426C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3427C
2 CX-3428C
3 CX-3429C
4 CX-3430C
5 CX-3431C
6 CX-3432C
7 CX-3433C
8 CX-3434C
9 CX-3435C
10 CX-3436C
11 CX-3437C
12 CX-3438C
13 CX-3439C
14 CX-3440C
15 CX-3441C
16 CX-3442C
17 CX-3443C
18 CX-3444C
19 CX-3445C
20 CX-3446C
21 CX-3447C
22 CX-3448C
23 CX-3449C
24 CX-3450C
25 CX-3451C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3452C
2 CX-3453C
3 CX-3454C
4 CX-3455C
5 CX-3456C
6 CX-3457C
7 CX-3458C
8 CX-3459C
9 CX-3460C
10 CX-3461C
11 CX-3462C
12 CX-3463C
13 CX-3464C
14 CX-3465C
15 CX-3466C
16 CX-3467C
17 CX-3468C
18 CX-3469C
19 CX-3470C
20 CX-3471C
21 CX-3472C
22 CX-3473C
23 CX-3474C
24 CX-3475C
25 CX-3476C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3477C
2 CX-3478C
3 CX-3479C
4 CX-3480C
5 CX-3481C
6 CX-3482C
7 CX-3483C
8 CX-3484C
9 CX-3485C
10 CX-3486C
11 CX-3487C
12 CX-3488C
13 CX-3489C
14 CX-3490C
15 CX-3491C
16 CX-3492C
17 CX-3493C
18 CX-3494C
19 CX-3495C
20 CX-3496C
21 CX-3497C
22 CX-3498C
23 CX-3499C
24 CX-3500C
25 CX-3501C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3502C
2 CX-3503C
3 CX-3504C
4 CX-3505C
5 CX-3506C
6 CX-3507C
7 CX-3508C
8 CX-3509C
9 CX-3510C
10 CX-3511C
11 CX-3512C
12 CX-3513C
13 CX-3514C
14 CX-3515C
15 CX-3516C
16 CX-3517C
17 CX-3518C
18 CX-3519C
19 CX-3520C
20 CX-3521C
21 CX-3522C
22 CX-3523C
23 CX-3524C
24 CX-3525C
25 CX-3526C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3527C
2 CX-3528C
3 CX-3529C
4 CX-3530C
5 CX-3531C
6 CX-3532C
7 CX-3533C
8 CX-3534C
9 CX-3535C
10 CX-3536C
11 CX-3537C
12 CX-3538C
13 CX-3539C
14 CX-3540C
15 CX-3541C
16 CX-3542C
17 CX-3543C
18 CX-3544C
19 CX-3545C
20 CX-3546C
21 CX-3547C
22 CX-3548C
23 CX-3549C
24 CX-3550C
25 CX-3551C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3552C
2 CX-3553C
3 CX-3554C
4 CX-3555C
5 CX-3556C
6 CX-3557C
7 CX-3558C
8 CX-3559C
9 CX-3560C
10 CX-3561C
11 CX-3562C
12 CX-3563C
13 CX-3564C
14 CX-3565C
15 CX-3566C
16 CX-3567C
17 CX-3568C
18 CX-3569C
19 CX-3570C
20 CX-3571C
21 CX-3572C
22 CX-3573C
23 CX-3574C
24 CX-3575C
25 CX-3576C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3577C
2 CX-3578C
3 CX-3579C
4 CX-3580C
5 CX-3581C
6 CX-3582C
7 CX-3583C
8 CX-3584C
9 CX-3585C
10 CX-3586C
11 CX-3587C
12 CX-3588C
13 CX-3589C
14 CX-3590C
15 CX-3591C
16 CX-3592C
17 CX-3593C
18 CX-3594C
19 CX-3595C
20 CX-3596C
21 CX-3597C
22 CX-3598C
23 CX-3599C
24 CX-3600C
25 CX-3601C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3602C
2 CX-3603C
3 CX-3604C
4 CX-3605C
5 CX-3606C
6 CX-3607C
7 CX-3608C
8 CX-3609C
9 CX-3610C
10 CX-3611C
11 CX-3612C
12 CX-3613C
13 CX-3614C
14 CX-3615C
15 CX-3616C
16 CX-3617C
17 CX-3618C
18 CX-3619C
19 CX-3620C
20 CX-3621C
21 CX-3622C
22 CX-3623C
23 CX-3624C
24 CX-3625C
25 CX-3626C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3627C
2 CX-3628C
3 CX-3629C
4 CX-3630C
5 CX-3631C
6 CX-3632C
7 CX-3633C
8 CX-3634C
9 CX-3635C
10 CX-3636C
11 CX-3637C
12 CX-3638C
13 CX-3639C
14 CX-3640C
15 CX-3641C
16 CX-3642C
17 CX-3643C
18 CX-3644C
19 CX-3645C
20 CX-3646C
21 CX-3647C
22 CX-3648C
23 CX-3649C
24 CX-3650C
25 CX-3651C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3652C
2 CX-3653C
3 CX-3654C
4 CX-3655C
5 CX-3656C
6 CX-3657C
7 CX-3658C
8 CX-3659C
9 CX-3660C
10 CX-3661C
11 CX-3662C
12 CX-3663C
13 CX-3664C
14 CX-3665C
15 CX-3666C
16 CX-3667C
17 CX-3668C
18 CX-3669C
19 CX-3670C
20 CX-3671C
21 CX-3672C
22 CX-3673C
23 CX-3674C
24 CX-3675C
25 CX-3676C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3677C
2 CX-3678C
3 CX-3679C
4 CX-3680C
5 CX-3681C
6 CX-3682C
7 CX-3683C
8 CX-3684C
9 CX-3685C
10 CX-3686C
11 CX-3687C
12 CX-3688C
13 CX-3689C
14 CX-3690C
15 CX-3691C
16 CX-3692C
17 CX-3693C
18 CX-3694C
19 CX-3695C
20 CX-3696C
21 CX-3697C
22 CX-3698C
23 CX-3699C
24 CX-3700C
25 CX-3701C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3702C
2 CX-3703C
3 CX-3704C
4 CX-3705C
5 CX-3706C
6 CX-3707C
7 CX-3708C
8 CX-3709C
9 CX-3710C
10 CX-3711C
11 CX-3712C
12 CX-3713C
13 CX-3714C
14 CX-3715C
15 CX-3716C
16 CX-3717C
17 CX-3718C
18 CX-3719C
19 CX-3720C
20 CX-3721C
21 CX-3722C
22 CX-3723C
23 CX-3724C
24 CX-3725C
25 CX-3726C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3727C
2 CX-3728C
3 CX-3729C
4 CX-3730C
5 CX-3731C
6 CX-3732C
7 CX-3733C
8 CX-3734C
9 CX-3735C
10 CX-3736C
11 CX-3737C
12 CX-3738C
13 CX-3739C
14 CX-3740C
15 CX-3741C
16 CX-3742C
17 CX-3743C
18 CX-3744C
19 CX-3745C
20 CX-3746C
21 CX-3747C
22 CX-3748C
23 CX-3749C
24 CX-3765C
25 CX-3766C

Heritage Reporting Corporation
(202) 628-4888

1 CX-3767C
2 CX-3782C
3 CX-3783C
4 CX-3784C
5 CX-3785C
6 CX-3786C
7 CX-3787C
8 CX-3788C
9 CX-3790C
10 CX-3791C
11 CX-3820C
12 CX-3905C
13 CX-4092C
14 CX-4095C
15 CX-4097C
16 CX-4098C
17 CX-4099C
18 CX-4100C
19 CX-4104C
20 CX-4105C
21 CX-4106C
22 CX-4107C
23 CX-4108C
24 CX-4109C
25 CX-4110C

Heritage Reporting Corporation
(202) 628-4888

1 CX-4111C
2 CX-4112C
3 CX-4113C
4 CX-4114C
5 CX-4115C
6 CX-4116C
7 CX-4206C
8 CX-4257C
9 CX-4259C
10 CX-4260C
11 CX-4261C
12 CX-4262C
13 CX-4263C
14 CX-4264C
15 CX-4265C
16 CX-4266C
17 CX-4267C
18 CX-4268C
19 CX-4269C
20 CX-4270C
21 CX-4271C
22 CX-4272C
23 CX-4273C
24 CX-4274C
25 CX-4275C

Heritage Reporting Corporation
(202) 628-4888

1 CX-4276C
2 CX-4277C
3 CX-4278C
4 CX-4279C
5 CX-4280C
6 CX-4281C
7 CX-4282C
8 CX-4283C
9 CX-4284C
10 CX-4285C
11 CX-4286C
12 CX-4287C
13 CX-4288C
14 CX-4289C
15 CX-4290C
16 CX-4292C
17 CX-4297C
18 CX-4299C
19 CX-4300C
20 CX-4301C
21 CX-4302C
22 CX-4303C
23 CX-4304C
24 CX-4305C
25 CX-4306C

Heritage Reporting Corporation
(202) 628-4888

1 CX-4307C
2 CX-4308C
3 CX-4309C
4 CX-4310C
5 CX-4311C
6 CX-4312C
7 CX-4313C
8 CX-4314C
9 CX-4315C
10 CX-4316C
11 CX-4317C
12 CX-4318C
13 CX-4319C
14 CX-4320
15 CX-4321C
16 CX-4322C
17 CX-4323
18 CX-4324
19 CX-4325
20 CX-4326
21 CX-4327
22 CX-4328C
23 CX-4330
24 CX-4331
25 CX-4333

Heritage Reporting Corporation
(202) 628-4888

1 CX-4334
2 CX-4336C
3 CX-4337C
4 CX-4338
5 CX-4341
6 CX-4342
7 CX-4343
8 CX-4344
9 CX-4345
10 CX-4346
11 CX-4347
12 CX-4348
13 CX-4349
14 CX-4350C
15 CX-4351
16 CX-4352
17 CX-4353
18 CX-4354
19 CX-4355
20 CX-4357C
21 CX-4360
22 CX-4361
23 CX-4362C
24 CX-4363
25 CX-4366

Heritage Reporting Corporation
(202) 628-4888

1 CX-4367
2 CX-4370
3 CX-4371
4 CX-4393
5 CX-4394
6 CX-4395
7 CX-4397
8 CX-4399
9 CX-4433
10 CX-4434
11 CX-4435
12 CX-4476
13 CX-4477
14 CX-4478
15 CX-4479
16 CX-4480
17 CX-4481
18 CX-4482
19 CX-4483
20 CX-4484
21 CX-4485
22 CX-4486
23 CX-4487
24 CX-4488
25 CX-4489

Heritage Reporting Corporation
(202) 628-4888

1 CX-4491
2 CX-4492
3 CX-4493
4 CX-4494
5 CX-4495
6 CX-4496
7 CX-4497
8 CX-4498
9 CX-4499
10 CX-4502
11 CX-4503
12 CX-4505
13 CX-4506
14 CX-4507
15 CX-4508
16 CX-4510
17 CX-4511
18 CX-4512
19 CX-4513
20 CX-4516
21 CX-4518
22 CX-4519
23 CX-4520
24 CX-4522
25 CX-4523

Heritage Reporting Corporation
(202) 628-4888

1 CX-4524
2 CX-4528C
3 CX-4529
4 CX-4530
5 CX-4531
6 CX-4532
7 CX-4535
8 CX-4536
9 CX-4539
10 CX-4542
11 CX-4543
12 CX-4544
13 CX-4546
14 CX-4547
15 CX-4548
16 CX-4549
17 CX-4554
18 CX-4555
19 CX-4556
20 CX-4557
21 CX-4560
22 CX-4561
23 CX-4562
24 CX-4563
25 CX-4564

Heritage Reporting Corporation
(202) 628-4888

1 CX-4566
2 CX-4567
3 CX-4568
4 CX-4572C
5 CX-4573C
6 CX-4574C
7 CX-4575C
8 CX-4576C
9 CX-4577C
10 CX-4579
11 CX-4581
12 CX-4583
13 CX-4584
14 CX-4587
15 CX-4589
16 CX-4590
17 CX-4594
18 CX-4595
19 CX-4596
20 CX-4597
21 CX-4599
22 CX-4602
23 CX-4603
24 CX-4605
25 CX-4606

Heritage Reporting Corporation
(202) 628-4888

1 CX-4607
2 CX-4608
3 CX-4610
4 CX-4619
5 CX-4620
6 CX-4621
7 CX-4622
8 CX-4623
9 CX-4624
10 CX-4627
11 CX-4628
12 CX-4629
13 CX-4630
14 CX-4631
15 CX-4635
16 CX-4636
17 CX-4637
18 CX-4645
19 CX-4646
20 CX-4647
21 CX-4648
22 CX-4686
23 CX-4687
24 CX-4688
25 CX-4689

Heritage Reporting Corporation
(202) 628-4888

1 CX-4705
2 CX-4706
3 CX-4707
4 CX-4708
5 CX-4709
6 CX-4710
7 CX-4711
8 CX-4712
9 CX-4713
10 CX-4714
11 CX-4715
12 CX-4716
13 CX-4717
14 CX-4718
15 CX-4719
16 CX-4720
17 CX-4721
18 CX-4722
19 CX-4723
20 CX-4724
21 CX-4726
22 CX-4727
23 CX-4728
24 CX-4731
25 CX-4732

Heritage Reporting Corporation
(202) 628-4888

1 CX-4733
2 CX-4734
3 CX-4735
4 CX-4738C
5 CX-4739C
6 CX-4740C
7 CX-4741C
8 CX-4742C
9 CX-4743C
10 CX-4744C
11 CX-4745C
12 CX-4746C
13 CX-4747C
14 CX-4748C
15 CX-4749C
16 CX-4750C
17 CX-4751C
18 CX-4752C
19 CX-4753C
20 CX-4754
21 CX-4755
22 CX-4756
23 CX-4757C
24 CX-4758C
25 CX-4759C

Heritage Reporting Corporation
(202) 628-4888

1 CX-4760C
2 CX-4761C
3 CX-4762
4 CX-4763C
5 CX-4764
6 CX-4765
7 CX-4766C
8 CX-4767
9 CX-4780
10 CX-4781
11 CX-4782
12 CX-4783
13 CX-4784
14 CX-4785
15 CX-4786
16 CX-4787
17 CX-4788
18 CX-4789
19 CX-4790
20 CX-4791
21 CX-4792
22 CX-4793
23 CX-4794C
24 CX-4795C
25 CX-4796C

Heritage Reporting Corporation
(202) 628-4888

1 CX-4797C
2 CX-4798C
3 CX-4799C
4 CX-4800C
5 CX-4801C
6 CX-4802C
7 CX-4803C
8 CX-4804C
9 CX-4805C
10 CX-4806C
11 CX-4807C
12 CX-4808C
13 CX-4809C
14 CX-4810C
15 CX-4811C
16 CX-4812C
17 CX-4813C
18 CX-4814C
19 CX-4815C
20 CX-4816C
21 CX-4817C
22 CX-4818C
23 CX-4819C
24 CX-4820C
25 CX-4821C

Heritage Reporting Corporation
(202) 628-4888

1 CX-4822C
2 CX-4823
3 CX-4824
4 CX-4825
5 CX-4826
6 CX-4827
7 CX-4828
8 CX-4829
9 CX-4830
10 CX-4831C
11 CX-4832C
12 CX-4833C
13 CX-4834C
14 CX-4835C
15 CX-4836C
16 CX-4837C
17 CX-4838C
18 CX-4839C
19 CX-4840C
20 CX-4841C
21 CX-4842C
22 CX-4843C
23 CX-4844C
24 CX-4845C
25 CX-4846C

Heritage Reporting Corporation
(202) 628-4888

1 CX-4847C
2 CX-4848C
3 CX-4849C
4 CX-4850C
5 CX-4851C
6 CX-4852C
7 CX-4853C
8 CX-4854C
9 CX-4855C
10 CX-4856C
11 CX-4857C
12 CX-4858
13 CX-4859C
14 CX-4860
15 CX-4861
16 CX-4862
17 CX-4863
18 CX-4864
19 CX-4865C
20 CX-4866C
21 CX-4867C
22 CX-4868C
23 CX-4869C
24 CX-4873C
25 CX-4874C

Heritage Reporting Corporation
(202) 628-4888

1 CX-4875C
2 CX-4876C
3 CX-4877C
4 CX-4879C
5 CX-4880C
6 CX-4886
7 CX-4887C
8 CX-4888C
9 CX-4889C
10 CX-4890C
11 CX-4891C
12 CX-4892C
13 CX-4893C
14 CX-4894C
15 CX-4895C
16 CX-4896C
17 CX-4897C
18 CX-4898C
19 CX-4899C
20 CX-4900C
21 CX-4901C
22 CX-4902C
23 CX-4903
24 CX-4904
25 CX-4905

Heritage Reporting Corporation
(202) 628-4888

1 CX-4906C
2 CX-4907C
3 CX-4911CBI
4 CX-4912CBI
5 CX-4913CBI
6 CX-4914C
7 CX-4915C
8 CX-4916C
9 CX-4917C
10 CX-4918C
11 CX-4919C
12 CX-4920C
13 CX-4921C
14 CX-4922C
15 CX-4924C
16 CX-4925
17 CX-4927
18 CX-4928
19 CX-4929
20 CX-4930
21 CX-4931
22 CX-4932
23 CX-4933
24 CX-4934
25 CX-4935C

Heritage Reporting Corporation
(202) 628-4888

1 CX-4936C
2 CX-4937C
3 CX-4938C
4 CX-4939C
5 CX-4940C
6 CX-4941C
7 CX-4942C
8 CX-4943C
9 CX-4944C
10 CX-4945C
11 CX-4946C
12 CX-4947C
13 CX-4948C
14 CX-4949C
15 CX-4950C
16 CX-4951C
17 CX-4952C
18 CX-4953C
19 CX-4954C
20 CX-4955C
21 CX-4956C
22 CX-4957C
23 CX-4958C
24 CX-4959C
25 CX-4960C

Heritage Reporting Corporation
(202) 628-4888

1 CX-4961C
2 CX-4962C
3 CX-4963C
4 CX-4964C
5 CX-4965C
6 CX-4966C
7 CX-4967C
8 CX-4968C
9 CX-4969C
10 CX-4970C
11 CX-4971C
12 CX-4972C
13 CX-4973C
14 CX-4974C
15 CX-4975C
16 CX-4976C
17 CX-4977C
18 CX-4978C
19 CX-4979C
20 CX-4980C
21 CX-4981C
22 CX-4982C
23 CX-4983C
24 CX-4984C
25 CX-4985C

Heritage Reporting Corporation
(202) 628-4888

1 CX-4986C
2 CX-4987C
3 CX-4988C
4 CX-4989C
5 CX-4990C
6 CX-4991C
7 CX-4992C
8 CX-4993C
9 CX-4994C
10 CX-4995C
11 CX-4996C
12 CX-4997C
13 CX-4998C
14 CX-4999C
15 CX-5000C
16 CX-5001C
17 CX-5002C
18 CX-5003C
19 CX-5004C
20 CX-5005C
21 CX-5006C
22 CX-5007C
23 CX-5008C
24 CX-5009C
25 CX-5010C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5011C
2 CX-5012C
3 CX-5013C
4 CX-5014C
5 CX-5015C
6 CX-5016C
7 CX-5017C
8 CX-5018C
9 CX-5019C
10 CX-5020C
11 CX-5021C
12 CX-5022C
13 CX-5023C
14 CX-5024C
15 CX-5025C
16 CX-5026C
17 CX-5027C
18 CX-5028C
19 CX-5029C
20 CX-5030C
21 CX-5031C
22 CX-5032C
23 CX-5033C
24 CX-5034C
25 CX-5035C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5036C
2 CX-5037C
3 CX-5038C
4 CX-5039C
5 CX-5040C
6 CX-5041C
7 CX-5042C
8 CX-5043C
9 CX-5044C
10 CX-5045C
11 CX-5046C
12 CX-5047C
13 CX-5048C
14 CX-5049C
15 CX-5050C
16 CX-5051C
17 CX-5052C
18 CX-5053C
19 CX-5054C
20 CX-5055C
21 CX-5056C
22 CX-5057C
23 CX-5058C
24 CX-5059C
25 CX-5060C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5061C
2 CX-5062C
3 CX-5063C
4 CX-5064C
5 CX-5065C
6 CX-5066C
7 CX-5067C
8 CX-5068C
9 CX-5069C
10 CX-5070C
11 CX-5071C
12 CX-5072C
13 CX-5073C
14 CX-5074C
15 CX-5075C
16 CX-5076C
17 CX-5077C
18 CX-5078C
19 CX-5079C
20 CX-5080C
21 CX-5081C
22 CX-5082C
23 CX-5083C
24 CX-5084C
25 CX-5085C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5086C
2 CX-5087C
3 CX-5088C
4 CX-5089C
5 CX-5090C
6 CX-5091C
7 CX-5092C
8 CX-5093C
9 CX-5094C
10 CX-5095C
11 CX-5096C
12 CX-5097C
13 CX-5098C
14 CX-5099C
15 CX-5100C
16 CX-5101C
17 CX-5102C
18 CX-5103C
19 CX-5104C
20 CX-5105C
21 CX-5106C
22 CX-5107C
23 CX-5108C
24 CX-5109C
25 CX-5110C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5111C
2 CX-5112C
3 CX-5113C
4 CX-5114C
5 CX-5115C
6 CX-5116C
7 CX-5117C
8 CX-5118C
9 CX-5119C
10 CX-5120C
11 CX-5121C
12 CX-5122C
13 CX-5123C
14 CX-5124C
15 CX-5125C
16 CX-5126C
17 CX-5127C
18 CX-5128C
19 CX-5129C
20 CX-5130C
21 CX-5131C
22 CX-5132C
23 CX-5133C
24 CX-5134C
25 CX-5135C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5136C
2 CX-5137C
3 CX-5138C
4 CX-5139C
5 CX-5140C
6 CX-5141C
7 CX-5142C
8 CX-5143C
9 CX-5144C
10 CX-5145C
11 CX-5146C
12 CX-5147C
13 CX-5148C
14 CX-5149C
15 CX-5150C
16 CX-5151C
17 CX-5152C
18 CX-5153C
19 CX-5154C
20 CX-5155C
21 CX-5156C
22 CX-5157C
23 CX-5158C
24 CX-5159C
25 CX-5160C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5161C
2 CX-5162C
3 CX-5163C
4 CX-5164C
5 CX-5165C
6 CX-5166C
7 CX-5167C
8 CX-5168C
9 CX-5169C
10 CX-5170C
11 CX-5171C
12 CX-5172C
13 CX-5173C
14 CX-5174C
15 CX-5175C
16 CX-5176C
17 CX-5177C
18 CX-5178C
19 CX-5179C
20 CX-5180C
21 CX-5181C
22 CX-5182C
23 CX-5183C
24 CX-5184C
25 CX-5185C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5186C
2 CX-5187C
3 CX-5188C
4 CX-5189C
5 CX-5190C
6 CX-5191C
7 CX-5192C
8 CX-5193C
9 CX-5194C
10 CX-5195C
11 CX-5196C
12 CX-5197C
13 CX-5198C
14 CX-5199C
15 CX-5200C
16 CX-5201C
17 CX-5202C
18 CX-5203C
19 CX-5204C
20 CX-5205C
21 CX-5206C
22 CX-5207C
23 CX-5208C
24 CX-5209C
25 CX-5210C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5211C
2 CX-5212C
3 CX-5213C
4 CX-5214C
5 CX-5215C
6 CX-5216C
7 CX-5217C
8 CX-5218C
9 CX-5219C
10 CX-5220C
11 CX-5221C
12 CX-5222C
13 CX-5223C
14 CX-5224C
15 CX-5225C
16 CX-5226C
17 CX-5227C
18 CX-5228C
19 CX-5229C
20 CX-5230C
21 CX-5231C
22 CX-5232C
23 CX-5233C
24 CX-5234C
25 CX-5235C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5236C
2 CX-5237C
3 CX-5238C
4 CX-5239C
5 CX-5240C
6 CX-5241C
7 CX-5242C
8 CX-5243C
9 CX-5244C
10 CX-5245C
11 CX-5246C
12 CX-5247C
13 CX-5248C
14 CX-5249C
15 CX-5250C
16 CX-5251C
17 CX-5252C
18 CX-5253C
19 CX-5254C
20 CX-5255C
21 CX-5256C
22 CX-5257C
23 CX-5258C
24 CX-5259C
25 CX-5260C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5261C
2 CX-5262C
3 CX-5263C
4 CX-5264C
5 CX-5265C
6 CX-5266C
7 CX-5267C
8 CX-5268C
9 CX-5269C
10 CX-5270C
11 CX-5271C
12 CX-5272C
13 CX-5273C
14 CX-5274C
15 CX-5275C
16 CX-5276C
17 CX-5277C
18 CX-5278C
19 CX-5279C
20 CX-5280C
21 CX-5281C
22 CX-5282C
23 CX-5283C
24 CX-5284C
25 CX-5285C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5286C
2 CX-5287C
3 CX-5288C
4 CX-5289C
5 CX-5290C
6 CX-5291C
7 CX-5292C
8 CX-5293C
9 CX-5294C
10 CX-5295C
11 CX-5296C
12 CX-5297C
13 CX-5298C
14 CX-5299C
15 CX-5300C
16 CX-5301C
17 CX-5302C
18 CX-5303C
19 CX-5304C
20 CX-5305C
21 CX-5306C
22 CX-5307C
23 CX-5308C
24 CX-5309C
25 CX-5310C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5311C
2 CX-5312C
3 CX-5313C
4 CX-5314C
5 CX-5315C
6 CX-5316C
7 CX-5317C
8 CX-5318C
9 CX-5319C
10 CX-5320C
11 CX-5321C
12 CX-5322C
13 CX-5323C
14 CX-5324C
15 CX-5325C
16 CX-5326C
17 CX-5327C
18 CX-5328C
19 CX-5329C
20 CX-5330C
21 CX-5331C
22 CX-5332C
23 CX-5333C
24 CX-5334C
25 CX-5335C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5336C
2 CX-5337C
3 CX-5338C
4 CX-5339C
5 CX-5340C
6 CX-5341C
7 CX-5342C
8 CX-5343C
9 CX-5344C
10 CX-5345C
11 CX-5346C
12 CX-5347C
13 CX-5348C
14 CX-5349C
15 CX-5350C
16 CX-5351C
17 CX-5352C
18 CX-5353C
19 CX-5354C
20 CX-5355C
21 CX-5356C
22 CX-5357C
23 CX-5358C
24 CX-5359C
25 CX-5360C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5361C
2 CX-5362C
3 CX-5363C
4 CX-5364C
5 CX-5365C
6 CX-5366C
7 CX-5367C
8 CX-5368C
9 CX-5369C
10 CX-5370C
11 CX-5371C
12 CX-5372C
13 CX-5373C
14 CX-5374C
15 CX-5375C
16 CX-5376C
17 CX-5377C
18 CX-5378C
19 CX-5379C
20 CX-5380C
21 CX-5381C
22 CX-5382C
23 CX-5383C
24 CX-5384C
25 CX-5385C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5386C
2 CX-5387C
3 CX-5388C
4 CX-5389C
5 CX-5390C
6 CX-5391C
7 CX-5392C
8 CX-5393C
9 CX-5394C
10 CX-5395C
11 CX-5396C
12 CX-5397C
13 CX-5398C
14 CX-5399C
15 CX-5400C
16 CX-5401C
17 CX-5402C
18 CX-5403C
19 CX-5404C
20 CX-5405C
21 CX-5406C
22 CX-5407C
23 CX-5408C
24 CX-5409C
25 CX-5410C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5411C
2 CX-5412C
3 CX-5413C
4 CX-5414C
5 CX-5415C
6 CX-5416C
7 CX-5417C
8 CX-5418
9 CX-5419
10 CX-5420
11 CX-5421
12 CX-5422
13 CX-5423
14 CX-5424
15 CX-5425C
16 CX-5426C
17 CX-5427C
18 CX-5428C
19 CX-5429C
20 CX-5430
21 CX-5431
22 CX-5432
23 CX-5433
24 CX-5434
25 CX-5435

Heritage Reporting Corporation
(202) 628-4888

1 CX-5436
2 CX-5437
3 CX-5438
4 CX-5439
5 CX-5440
6 CX-5441
7 CX-5442
8 CX-5443
9 CX-5444
10 CX-5445
11 CX-5446
12 CX-5447
13 CX-5448
14 CX-5449
15 CX-5450
16 CX-5451
17 CX-5452
18 CX-5453
19 CX-5454
20 CX-5455
21 CX-5456
22 CX-5457
23 CX-5458
24 CX-5459
25 CX-5460

Heritage Reporting Corporation
(202) 628-4888

1 CX-5461
2 CX-5462
3 CX-5463
4 CX-5464
5 CX-5465C
6 CX-5466C
7 CX-5467
8 CX-5468C
9 CX-5469C
10 CX-5470
11 CX-5471C
12 CX-5472
13 CX-5473C
14 CX-5474C
15 CX-5475C
16 CX-5476C
17 CX-5477C
18 CX-5478C
19 CX-5479
20 CX-5480C
21 CX-5481C
22 CX-5482C
23 CX-5483C
24 CX-5484C
25 CX-5485C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5486C
2 CX-5487C
3 CX-5488C
4 CX-5489C
5 CX-5490C
6 CX-5491C
7 CX-5492C
8 CX-5493C
9 CX-5494C
10 CX-5495C
11 CX-5496C
12 CX-5497C
13 CX-5498C
14 CX-5499C
15 CX-5500C
16 CX-5501C
17 CX-5502C
18 CX-5503C
19 CX-5504C
20 CX-5505C
21 CX-5506C
22 CX-5507C
23 CX-5508C
24 CX-5509C
25 CX-5510C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5511C
2 CX-5512C
3 CX-5513C
4 CX-5514C
5 CX-5515
6 CX-5516
7 CX-5517
8 CX-5518C
9 CX-5520C
10 CX-5521C
11 CX-5522C
12 CX-5523C
13 CX-5524C
14 CX-5525C
15 CX-5526C
16 CX-5527C
17 CX-5528C
18 CX-5529C
19 CX-5530C
20 CX-5531C
21 CX-5532C
22 CX-5533C
23 CX-5534C
24 CX-5535C
25 CX-5536C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5537C
2 CX-5538C
3 CX-5539C
4 CX-5540C
5 CX-5541C
6 CX-5542C
7 CX-5543C
8 CX-5544C
9 CX-5545C
10 CX-5546C
11 CX-5547C
12 CX-5548C
13 CX-5549C
14 CX-5550C
15 CX-5551C
16 CX-5552C
17 CX-5553C
18 CX-5554C
19 CX-5556C
20 CX-5557C
21 CX-5558C
22 CX-5559C
23 CX-5560C
24 CX-5561C
25 CX-5562C

Heritage Reporting Corporation
(202) 628-4888

1 CX-5563C
2 CX-5564C
3 CX-5565C
4 CX-5566C
5 CX-5567C
6 CX-5568C
7 CX-5569C
8 CX-5570
9 CX-5571
10 CX-5572C
11 CX-5573C
12 CX-5574C
13 CX-5575C
14 CX-5576C
15 CX-5577C
16 CX-5578C
17 CX-5579C
18 CX-5580C
19 CX-5581C
20 CX-5582C
21 CX-5583C
22 CX-5585
23 CX-5586
24 CX-5587
25 CX-5589

Heritage Reporting Corporation
(202) 628-4888

1 CX-5598
2 CX-5599
3 CX-5600
4 CX-5601
5 CX-5602
6 CX-5603
7 CX-5604
8 CX-5605
9 CX-5606
10 CX-5607
11 CX-5608
12 CX-5609
13 CX-5610
14 CX-5611
15 CX-5612
16 CX-5613
17 CX-5614
18 CX-5615
19 CX-5616
20 CX-5617
21 CX-5618
22 CX-5619
23 CX-5620
24 CX-5621
25 CX-5622

Heritage Reporting Corporation
(202) 628-4888

1 CX-5623
2 CX-5624
3 CX-5625
4 CX-5626
5 CX-5628
6 CX-5629
7 CX-5631
8 CX-5632
9 CX-5633
10 CX-5634
11 CX-5642
12 CX-5645C
13 CX-5646C
14 CX-5647
15 CX-5648
16 CX-5649
17 CX-5650
18 CX-5651C
19 CX-5652C
20 CX-5653C
21 CX-5654C
22 CX-5655
23 CX-5656
24 CX-5657
25 CX-5658

Heritage Reporting Corporation
(202) 628-4888

1 CX-5659
2 CX-5660
3 CX-5661
4 CX-5662
5 CX-5663
6 CX-5664
7 CX-5665
8 CX-5666
9 CX-5667
10 CX-5668
11 CX-5669
12 CX-5670
13 CX-5671
14 CX-5672
15 CX-5673
16 CX-5674
17 CX-5675
18 CX-5676
19 CX-5677
20 CX-5678
21 CX-5679
22 CX-5680
23 CX-5681
24 CX-5700
25 CX-5701

Heritage Reporting Corporation
(202) 628-4888

1 CX-5702C
2 CX-5703C
3 CX-5704C
4 CX-5705
5 CX-5707C
6 CX-5708C
7 CX-5711
8 CX-5770
9 CX-5771
10 CX-5776
11 CX-5777
12 CX-5778C
13 CX-5794C
14 CX-5795C
15 CX-5796C
16 CX-5804C
17 CX-5805C
18 CX-5806C
19 CX-5807C
20 CX-5808
21 CX-5809
22 CX-5810
23 CX-5811
24 CX-5862C
25 CX-5905

Heritage Reporting Corporation
(202) 628-4888

1 CX-5906
2 CX-5907
3 CX-5908
4 CX-5909
5 CX-5910
6 CX-5911
7 CX-5912
8 CX-5913
9 CX-5914
10 CX-5915
11 CX-5916
12 CX-5917
13 CX-5918
14 CX-5919
15 CX-5920
16 CX-5921
17 CX-5922
18 CX-5923
19 CX-5924
20 CX-5925
21 CX-5926
22 CX-5927
23 CX-5928
24 CX-5929
25 CX-5930

Heritage Reporting Corporation
(202) 628-4888

1 CX-5931
2 CX-5932
3 CX-5933
4 CX-5934
5 CX-5935
6 CX-5936
7 CX-5939
8 CX-5940
9 CX-5941
10 CX-5942
11 CX-5943
12 CX-5945
13 CX-5946
14 CX-5947
15 CX-5948
16 CX-5949
17 CX-5950
18 CX-5951
19 CX-5952
20 CX-5954
21 CX-5955
22 CX-5956
23 CX-5958
24 CX-5963
25 CX-5967

Heritage Reporting Corporation
(202) 628-4888

1 CX-5970
2 CX-5981
3 CX-5982
4 CX-5983
5 CX-5984
6 CX-5989
7 CX-5993
8 CX-5994
9 CX-6027
10 CX-6028
11 CX-6030
12 CX-6034
13 CX-6035
14 CX-6036
15 CX-6037
16 CX-6147
17 CX-6148
18 CX-6149
19 CX-6150
20 CX-6151
21 CX-6152
22 CX-6160
23 CX-6163C
24 CX-6166
25 CX-6171

Heritage Reporting Corporation
(202) 628-4888

1 CX-6172
2 CX-6173
3 CX-6174
4 CX-6175
5 CX-6194
6 CX-6195
7 CX-6196
8 CX-6200
9 CX-6201
10 CX-6202
11 CX-6203
12 CX-6204
13 CX-6205
14 CX-6206
15 CX-6207
16 CX-6208
17 CX-6209
18 CX-6210
19 CX-6211
20 CX-6212
21 CX-6213
22 CX-6214
23 CX-6215
24 CX-6217
25 CX-6221

Heritage Reporting Corporation
(202) 628-4888

1 CX-6242
2 CX-6243
3 CX-6245
4 CX-6247
5 CX-6248
6 CX-6249
7 CX-6250
8 CX-6251
9 CX-6252
10 CX-6253
11 CX-6254
12 CX-6255
13 CX-6256
14 CX-6258
15 CX-6259
16 CX-6260
17 CX-6451
18 CX-6453
19 CX-6455
20 CX-6640
21 CX-6642
22 CX-6683
23 CX-6731
24 CX-6732
25 CX-6733

Heritage Reporting Corporation
(202) 628-4888

1 CX-6734
2 CX-6735
3 CX-6736
4 CX-6737
5 CX-7121
6 CX-7122
7 CX-7128C
8 CX-7129
9 CX-7130
10 CX-7131
11 CX-7132
12 CX-7133
13 CX-7134
14 CX-7135
15 CX-7136
16 CX-7137
17 CX-7138
18 CX-7139
19 CX-7140
20 CX-7141
21 CX-7142
22 CX-7143
23 CX-7144
24 CX-7145
25 CX-7146

Heritage Reporting Corporation
(202) 628-4888

1 CX-7147
2 CX-7148
3 CX-7149
4 CX-7150
5 CX-7151
6 CX-7152
7 CX-7153
8 CX-7154
9 CX-7155
10 CX-7156
11 CX-7157
12 CX-7158
13 CX-7159
14 CX-7160
15 CX-7161
16 CX-7162
17 CX-7163
18 CX-7164
19 CX-7165
20 CX-7166
21 CX-7167
22 CX-7168
23 CX-7169
24 CX-7170
25 CX-7171

Heritage Reporting Corporation
(202) 628-4888

1 CX-7172
2 CX-7173
3 CX-7174
4 CX-7175
5 CX-7176
6 CX-7177
7 CX-7178
8 CX-7179
9 CX-7180
10 CX-7181
11 CX-7182
12 CX-7183
13 CX-7184
14 CX-7185
15 CX-7186
16 CX-7187
17 CX-7188
18 CX-7189
19 CX-7190
20 CX-7191
21 CX-7192
22 CX-7193
23 CX-7194
24 CX-7195
25 CX-7196

Heritage Reporting Corporation
(202) 628-4888

1 CX-7197
2 CX-7198
3 CX-7199
4 CX-7200
5 CX-7201
6 CX-7202
7 CX-7203
8 CX-7204
9 CX-7205
10 CX-7206
11 CX-7207
12 CX-7208
13 CX-7209
14 CX-7210
15 CX-7211
16 CX-7212
17 CX-7213
18 CX-7214
19 CX-7215
20 CX-7216
21 CX-7217
22 CX-7218
23 CX-7219
24 CX-7220
25 CX-7221

Heritage Reporting Corporation
(202) 628-4888

1 CX-7222
2 CX-7223
3 CX-7224
4 CX-7225
5 CX-7226
6 CX-7227
7 CX-7228
8 CX-7229
9 CX-7230
10 CX-7231
11 CX-7232
12 CX-7233
13 CX-7234
14 CX-7235
15 CX-7236
16 CX-7237
17 CX-7238
18 CX-7239
19 CX-7240
20 CX-7241
21 CX-7242
22 CX-7243
23 CX-7244
24 CX-7245
25 CX-7246

Heritage Reporting Corporation
(202) 628-4888

1 CX-7247
2 CX-7248
3 CX-7249
4 CX-7250
5 CX-7260
6 CX-7264
7 CX-7270
8 CX-7279
9 CX-7281
10 CX-7285
11 CX-7289
12 CX-7290
13 CX-7292
14 CX-7296
15 CX-7300
16 CX-7370
17 CX-7371
18 CX-7372
19 CX-7374
20 CX-7375
21 CX-7381
22 CX-7383
23 CX-7384
24 CX-7385
25 CX-7386

Heritage Reporting Corporation
(202) 628-4888

1 CX-7387
2 CX-7388
3 CX-7389
4 CX-7390
5 CX-7469
6 CX-7470
7 CX-7471
8 CX-7563
9 CX-7566
10 CX-7567
11 CX-7568
12 CX-7569
13 CX-7570
14 CX-7571
15 CX-7572
16 CX-7573
17 CX-7574
18 CX-7575
19 CX-7576
20 CX-7577
21 CX-7578
22 CX-7579
23 CX-7580
24 CX-7581
25 CX-7582

Heritage Reporting Corporation
(202) 628-4888

1 CX-7583
2 CX-7584
3 CX-7585
4 CX-7586
5 CX-7587
6 CX-7588
7 CX-7589
8 CX-7590
9 CX-7592
10 CX-7593
11 CX-7597
12 CX-7598
13 CX-7599
14 CX-7600
15 CX-7601
16 CX-7602
17 CX-7603
18 CX-7604
19 CX-7605
20 CX-7606
21 CX-7607
22 CX-7608
23 CX-7609
24 CX-7610
25 CX-7611

Heritage Reporting Corporation
(202) 628-4888

1 CX-7612
2 CX-7613
3 CX-7614
4 CX-7615
5 CX-7616
6 CX-7617
7 CX-7618
8 CX-7619
9 CX-7620
10 CX-7621
11 CX-7622
12 CX-7623
13 CX-7624
14 CX-7625
15 CX-7626
16 CX-7627
17 CX-7628
18 CX-7629
19 CX-7630
20 CX-7631
21 CX-7632
22 CX-7633
23 CX-7634
24 CX-7635
25 CX-7636

Heritage Reporting Corporation
(202) 628-4888

1 CX-7637
2 CX-7638
3 CX-7639
4 CX-7640
5 CX-7641
6 CX-7642
7 CX-7643
8 CX-7644
9 CX-7645
10 CX-7646
11 CX-7647
12 CX-7648
13 CX-7649
14 CX-7650
15 CX-7651
16 CX-7676
17 CX-7677
18 CX-7681
19 CX-7682
20 CX-7684
21 CX-7685
22 CX-7686
23 CX-7687
24 CX-7688
25 CX-7689

Heritage Reporting Corporation
(202) 628-4888

1 CX-7690
2 CX-7691
3 CX-7692
4 CX-7693
5 CX-7694
6 CX-7695
7 CX-7696
8 CX-7697
9 CX-7698
10 CX-7699
11 CX-7700
12 CX-7701
13 CX-7702
14 CX-7703
15 CX-7704
16 CX-7705
17 CX-7706
18 CX-7707
19 CX-7708
20 CX-7709
21 CX-7710
22 CX-7711
23 CX-7712
24 CX-7713
25 CX-7714

Heritage Reporting Corporation
(202) 628-4888

1 CX-7715
2 CX-7727
3 CX-7728
4 CX-7729
5 CX-7730
6 CX-7731
7 CX-7732
8 CX-7733
9 CX-7734
10 CX-7735
11 CX-7736
12 CX-7737
13 CX-7738
14 CX-7739
15 CX-7740
16 CX-7741
17 CX-7742
18 CX-7743
19 CX-7744
20 CX-7745
21 CX-7746
22 CX-7747
23 CX-7748
24 CX-7749
25 CX-7750

Heritage Reporting Corporation
(202) 628-4888

1 CX-7751
2 CX-7752
3 CX-7753
4 CX-7754
5 CX-7755
6 CX-7756
7 CX-7757
8 CX-7758
9 CX-7759
10 CX-7760
11 CX-7761
12 CX-7762
13 CX-7763
14 CX-7764
15 CX-7765
16 CX-7766
17 CX-7767
18 CX-7768
19 CX-7769
20 CX-7770
21 CX-7771
22 CX-7772
23 CX-7773
24 CX-7774
25 CX-7775

Heritage Reporting Corporation
(202) 628-4888

1 CX-7776
2 CX-7777
3 CX-7778
4 CX-7779
5 CX-7780
6 CX-7781
7 CX-7782
8 CX-7783
9 CX-7784
10 CX-7785
11 CX-7786
12 CX-7787
13 CX-7788
14 CX-7789
15 CX-7790
16 CX-7791
17 CX-7792
18 CX-7793
19 CX-7794
20 CX-7795
21 CX-7796
22 CX-7797
23 CX-7798
24 CX-7799
25 CX-7800

Heritage Reporting Corporation
(202) 628-4888

1 CX-7801
2 CX-7802
3 CX-7803
4 CX-7804
5 CX-7805
6 CX-7806
7 CX-7807
8 CX-7808
9 CX-7809
10 CX-7810
11 CX-7811
12 CX-7812
13 CX-7813
14 CX-7814
15 CX-7815
16 CX-7816
17 CX-7817
18 CX-7818
19 CX-7819
20 CX-7820
21 CX-7821
22 CX-7822
23 CX-7823
24 CX-7824
25 CX-7825

Heritage Reporting Corporation
(202) 628-4888

1 CX-7826
2 CX-7827
3 CX-7828
4 CX-7829
5 CX-7830
6 CX-7831
7 CX-7832
8 CX-7833
9 CX-7834
10 CX-7835
11 CX-7836
12 CX-7837
13 CX-7838
14 CX-7839
15 CX-7840
16 CX-7841
17 CX-7842
18 CX-7843
19 CX-7891
20 CX-7916
21 CX-7920
22 CX-7921
23 CX-7927
24 CX-7930
25 CX-7953

Heritage Reporting Corporation
(202) 628-4888

1 CX-7954
2 CX-7955
3 CX-7956
4 CX-7957
5 CX-7958
6 CX-7962
7 CX-7963
8 CX-7964
9 CX-7965
10 CX-7966
11 CX-7967
12 CX-7968
13 CX-7969
14 CX-7970
15 CX-7971
16 CX-7976
17 CX-7977
18 CX-7978
19 CX-7979
20 CX-7981
21 CX-7982
22 CX-7983
23 CX-7984
24 CX-7985
25 CX-7986

Heritage Reporting Corporation
(202) 628-4888

1 CX-7987
2 CX-7988
3 CX-7989
4 CX-7990
5 CX-7991
6 CX-7992
7 CX-7993
8 CX-7994
9 CX-7995
10 CX-7996
11 CX-7997
12 CX-7998
13 CX-7999
14 CX-8000
15 CX-8001
16 CX-8002
17 CX-8003
18 CX-8004
19 CX-8005
20 CX-8006
21 CX-8007
22 CX-8008
23 CX-8009
24 CX-8010
25 CX-8011

Heritage Reporting Corporation
(202) 628-4888

1 CX-8012
2 CX-8013
3 CX-8014
4 CX-8015
5 CX-8016
6 CX-8017
7 CX-8018
8 CX-8019
9 CX-8020
10 CX-8021
11 CX-8022
12 CX-8023
13 CX-8024
14 CX-8025
15 CX-8026
16 CX-8027
17 CX-8028
18 CX-8029
19 CX-8030
20 CX-8031
21 CX-8032
22 CX-8033
23 CX-8038
24 CX-8039
25 CX-8040

Heritage Reporting Corporation
(202) 628-4888

1 CX-8041
2 CX-8042
3 CX-8043
4 CX-8044
5 CX-8045
6 CX-8046
7 CX-8047
8 CX-8048
9 CX-8049
10 CX-8050
11 CX-8051
12 CX-8052
13 CX-8053
14 CX-8054
15 CX-8055
16 CX-8056
17 CX-8062
18 CX-8063
19 CX-8064
20 CX-8065
21 CX-8066
22 CX-8067
23 CX-8068
24 CX-8069
25 CX-8070

Heritage Reporting Corporation
(202) 628-4888

1 CX-8071
2 CX-8072
3 CX-8073
4 CX-8074
5 CX-8075
6 CX-8076
7 CX-8077
8 CX-8078
9 CX-8079
10 CX-8080
11 CX-8081
12 CX-8082
13 CX-8083
14 CX-8084
15 CX-8085
16 CX-8086
17 CX-8087
18 CX-8088
19 CX-8089
20 CX-8091
21 CX-8094
22 CX-8105
23 CX-8106
24 CX-8107C
25 CX-8108

Heritage Reporting Corporation
(202) 628-4888

1 CX-8109C
2 CX-8113C
3 CX-8114C
4 CX-8115C
5 CX-8116C
6 CX-8117C
7 CX-8118C
8 CX-8120C
9 CX-8122C
10 CX-8124C
11 CX-8125C
12 CX-8126
13 CX-8127C
14 CX-8128C
15 CX-8131C
16 CX-8133C
17 CX-8134
18 CX-8135
19 CX-8136
20 CX-8137C
21 CX-8138C
22 CX-8139C
23 CX-8140C
24 CX-8141C
25 CX-8142C

Heritage Reporting Corporation
(202) 628-4888

1 CX-8143C
2 CX-8145C
3 CX-8146C
4 CX-8147C
5 CX-8148C
6 CX-8149C
7 CX-8150C
8 CX-8151C
9 CX-8152
10 CX-8156
11 CX-8157C
12 CX-8158
13 CX-8159C
14 CX-8160C
15 CX-8164C
16 CX-8165C
17 CX-8166
18 CX-8167C
19 CX-8168C
20 CX-8169C
21 CX-8170C
22 CX-8173C
23 CX-8174C
24 CX-8176C
25 CX-8177C

Heritage Reporting Corporation
(202) 628-4888

1 CX-8178
2 CX-8182
3 CX-8183C
4 CX-8184C
5 CX-8185C
6 CX-8189
7 CX-8190C
8 CX-8191C
9 CX-8192C
10 CX-8193C
11 CX-8194C
12 CX-8197C
13 CX-8198C
14 CX-8199C
15 CX-8200C
16 CX-8201
17 CX-8229C
18 CX-8269C
19 CX-8275C
20 CX-8276C
21 CX-8277C
22 CX-8278C
23 CX-8279C
24 CX-8280C
25 CX-8281C

Heritage Reporting Corporation
(202) 628-4888

1 CX-8282C
2 CX-8433C
3 CX-8576
4 CX-8578C
5 CX-8579C
6 CX-8580C
7 CX-8581C
8 CX-8582C
9 CX-8583C
10 CX-8584C
11 CX-8585C
12 CX-8586C
13 CX-8587C
14 CX-8588C
15 CX-8589C
16 CX-8590C
17 CX-8591C
18 CX-8592C
19 CX-8593C
20 CX-8594C
21 CX-8595C
22 CX-8596C
23 CX-8597C
24 CX-8598C
25 CX-8599C

Heritage Reporting Corporation
(202) 628-4888

1 CX-8600C
2 CX-8601C
3 CX-8602C
4 CX-8603C
5 CX-8604C
6 CX-8605C
7 CX-8606C
8 CX-8607C
9 CX-8608C
10 CX-8609C
11 CX-8610C
12 CX-8611C
13 CX-8612C
14 CX-8613C
15 CX-8614C
16 CX-8615C
17 CX-8616C
18 CX-8617C
19 CX-8618C
20 CX-8619C
21 CX-8620C
22 CX-8621C
23 CX-8622C
24 CX-8623C
25 CX-8624C

Heritage Reporting Corporation
(202) 628-4888

1 CX-8625C
2 CX-8626C
3 CX-8627C
4 CX-8628C
5 CX-8629C
6 CX-8630C
7 CX-8631C
8 CX-8632C
9 CX-8633C
10 CX-8634C
11 CX-8635C
12 CX-8636C
13 CX-8637C
14 CX-8638C
15 CX-8639C
16 CX-8640C
17 CX-8641C
18 CX-8642C
19 CX-8643C
20 CX-8650
21 CX-8651
22 CX-8652
23 CX-8653
24 CX-8654
25 CX-8655

Heritage Reporting Corporation
(202) 628-4888

1 CX-8656
2 CX-8657
3 CX-8658
4 CX-8699C
5 CX-8700C
6 CX-8701C
7 CX-8702C
8 CX-8704C
9 CX-8705C
10 CX-8706C
11 CX-8707C
12 CX-8709C
13 CX-8710C
14 CX-8711C
15 CX-8712C
16 CX-8713C
17 CX-8714C
18 CX-8715C
19 CX-8716C
20 CX-8717C
21 CX-8718C
22 CX-8719C
23 CX-8720C
24 CX-8721C
25 CX-8722C

Heritage Reporting Corporation
(202) 628-4888

1 CX-8723C
2 CX-8725C
3 CX-8726C
4 CX-8727C
5 CX-8728C
6 CX-8729C
7 CX-8730C
8 CX-8731C
9 CPX-0001
10 CPX-0002
11 CPX-0003
12 CPX-0004C
13 CPX-0005C
14 CPX-0006C
15 CPX-0007C
16 CPX-0008C
17 CPX-0009C
18 CPX-0010C
19 CPX-0011C
20 CPX-0012C
21 CPX-0013C
22 CPX-0014
23 CPX-0015C
24 CPX-0016C
25 CPX-0017C

Heritage Reporting Corporation
(202) 628-4888

1 Respondents' Admitted List of Exhibits
2 RX-0001
3 RX-0002
4 RX-0003
5 RX-0004
6 RX-0005
7 RX-0007
8 RX-0008
9 RX-0009
10 RX-0010
11 RX-0011
12 RX-0012
13 RX-0013
14 RX-0015
15 RX-0016
16 RX-0017
17 RX-0018
18 RX-0019
19 RX-0020
20 RX-0021
21 RX-0022
22 RX-0023
23 RX-0024
24 RX-0025
25 RX-0026

Heritage Reporting Corporation
(202) 628-4888

1 RX-0027
2 RX-0028
3 RX-0029
4 RX-0030
5 RX-0031
6 RX-0032
7 RX-0033
8 RX-0034
9 RX-0035
10 RX-0036
11 RX-0037
12 RX-0038
13 RX-0039
14 RX-0043
15 RX-0044C
16 RX-0045C
17 RX-0048
18 RX-0049
19 RX-0050
20 RX-0052C
21 RX-0053C
22 RX-0054C
23 RX-0055C
24 RX-0056C
25 RX-0057C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0058C
2 RX-0059C
3 RX-0060C
4 RX-0061C
5 RX-0062C
6 RX-0063
7 RX-0064
8 RX-0065
9 RX-0066
10 RX-0067
11 RX-0068C
12 RX-0069C
13 RX-0070
14 RX-0071
15 RX-0072
16 RX-0073
17 RX-0074
18 RX-0075
19 RX-0076
20 RX-0078
21 RX-0079
22 RX-0080
23 RX-0081
24 RX-0082
25 RX-0083C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0084
2 RX-0085C
3 RX-0091
4 RX-0093
5 RX-0094
6 RX-0103C
7 RX-0105C
8 RX-0106C
9 RX-0107C
10 RX-0108C
11 RX-0109C
12 RX-0110C
13 RX-0111C
14 RX-0112C
15 RX-0113C
16 RX-0114C
17 RX-0115C
18 RX-0116C
19 RX-0117C
20 RX-0118C
21 RX-0120C
22 RX-0121C
23 RX-0122C
24 RX-0123C
25 RX-0124C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0125C
2 RX-0126C
3 RX-0127C
4 RX-0128C
5 RX-0129C
6 RX-0130C
7 RX-0131C
8 RX-0132C
9 RX-0133C
10 RX-0134C
11 RX-0135C
12 RX-0136C
13 RX-0137C
14 RX-0138C
15 RX-0139C
16 RX-0140C
17 RX-0141C
18 RX-0142C
19 RX-0143C
20 RX-0144C
21 RX-0145C
22 RX-0146C
23 RX-0147C
24 RX-0148C
25 RX-0149C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0150C
2 RX-0151C
3 RX-0152C
4 RX-0153C
5 RX-0154C
6 RX-0155C
7 RX-0156C
8 RX-0157C
9 RX-0158C
10 RX-0159C
11 RX-0160C
12 RX-0161C
13 RX-0163C
14 RX-0164C
15 RX-0165
16 RX-0166C
17 RX-0167C
18 RX-0168C
19 RX-0169C
20 RX-0172C
21 RX-0174C
22 RX-0175C
23 RX-0196
24 RX-0197
25 RX-0198

Heritage Reporting Corporation
(202) 628-4888

1 RX-0199
2 RX-0200
3 RX-0201
4 RX-0202
5 RX-0203
6 RX-0208C
7 RX-0210C
8 RX-0211C
9 RX-0212C
10 RX-0213C
11 RX-0214C
12 RX-0215C
13 RX-0216C
14 RX-0217
15 RX-0218C
16 RX-0219C
17 RX-0220
18 RX-0222C
19 RX-0223C
20 RX-0224C
21 RX-0228C
22 RX-0229C
23 RX-0230C
24 RX-0231C
25 RX-0232C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0233C
2 RX-0234C
3 RX-0235C
4 RX-0236C
5 RX-0237C
6 RX-0239
7 RX-0240
8 RX-0241
9 RX-0242
10 RX-0243
11 RX-0244
12 RX-0245
13 RX-0248
14 RX-0249
15 RX-0250
16 RX-0251
17 RX-0252
18 RX-0253
19 RX-0254
20 RX-0255C
21 RX-0256C
22 RX-0257C
23 RX-0258C
24 RX-0259C
25 RX-0260C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0261C
2 RX-0262C
3 RX-0263C
4 RX-0264C
5 RX-0265C
6 RX-0266C
7 RX-0267C
8 RX-0268
9 RX-0269
10 RX-0270
11 RX-0271
12 RX-0272
13 RX-0273C
14 RX-0274C
15 RX-0275C
16 RX-0276C
17 RX-0277C
18 RX-0278C
19 RX-0279C
20 RX-0280C
21 RX-0281C
22 RX-0282C
23 RX-0283
24 RX-0284
25 RX-0285C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0286
2 RX-0287
3 RX-0288
4 RX-0289
5 RX-0290
6 RX-0291
7 RX-0292
8 RX-0293C
9 RX-0294C
10 RX-0295
11 RX-0296
12 RX-0297
13 RX-0298C
14 RX-0299
15 RX-0300
16 RX-0301
17 RX-0302C
18 RX-0304
19 RX-0305
20 RX-0306
21 RX-0307C
22 RX-0308
23 RX-0309
24 RX-0310C
25 RX-0311C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0312
2 RX-0313C
3 RX-0314C
4 RX-0315
5 RX-0316
6 RX-0317
7 RX-0318C
8 RX-0319
9 RX-0320C
10 RX-0321
11 RX-0322C
12 RX-0323
13 RX-0324
14 RX-0325
15 RX-0328
16 RX-0329
17 RX-0330
18 RX-0331
19 RX-0332
20 RX-0333
21 RX-0334
22 RX-0335
23 RX-0336
24 RX-0337
25 RX-0338

Heritage Reporting Corporation
(202) 628-4888

1 RX-0339
2 RX-0340
3 RX-0341
4 RX-0342
5 RX-0343
6 RX-0344
7 RX-0345
8 RX-0346
9 RX-0347
10 RX-0348
11 RX-0349
12 RX-0350
13 RX-0351
14 RX-0352C
15 RX-0354
16 RX-0355
17 RX-0356
18 RX-0357
19 RX-0358C
20 RX-0359C
21 RX-0360C
22 RX-0361
23 RX-0362
24 RX-0363C
25 RX-0364

Heritage Reporting Corporation
(202) 628-4888

1 RX-0365
2 RX-0366
3 RX-0367
4 RX-0368
5 RX-0369
6 RX-0370
7 RX-0371
8 RX-0372
9 RX-0373
10 RX-0374
11 RX-0375
12 RX-0376
13 RX-0377
14 RX-0378
15 RX-0379
16 RX-0380
17 RX-0381
18 RX-0382
19 RX-0383
20 RX-0384
21 RX-0385
22 RX-0386
23 RX-0387
24 RX-0388
25 RX-0389

Heritage Reporting Corporation
(202) 628-4888

1 RX-0390
2 RX-0391
3 RX-0392
4 RX-0393
5 RX-0394
6 RX-0395
7 RX-0396
8 RX-0397
9 RX-0398
10 RX-0399
11 RX-0400
12 RX-0401
13 RX-0402
14 RX-0403
15 RX-0404
16 RX-0405
17 RX-0406
18 RX-0407
19 RX-0408
20 RX-0409
21 RX-0410C
22 RX-0411C
23 RX-0412
24 RX-0413
25 RX-0414

Heritage Reporting Corporation
(202) 628-4888

1 RX-0415C
2 RX-0416C
3 RX-0417
4 RX-0418
5 RX-0419
6 RX-0420
7 RX-0423
8 RX-0424
9 RX-0425
10 RX-0428
11 RX-0429
12 RX-0430
13 RX-0431C
14 RX-0432C
15 RX-0433C
16 RX-0434C
17 RX-0435C
18 RX-0436C
19 RX-0437C
20 RX-0438C
21 RX-0439C
22 RX-0440C
23 RX-0441C
24 RX-0442C
25 RX-0443C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0444C
2 RX-0445C
3 RX-0446C
4 RX-0447C
5 RX-0448C
6 RX-0449C
7 RX-0450C
8 RX-0451C
9 RX-0452C
10 RX-0453C
11 RX-0454C
12 RX-0455C
13 RX-0456C
14 RX-0457C
15 RX-0458C
16 RX-0459C
17 RX-0460C
18 RX-0461
19 RX-0462
20 RX-0463
21 RX-0464
22 RX-0465C
23 RX-0467C
24 RX-0468C
25 RX-0469

Heritage Reporting Corporation
(202) 628-4888

1 RX-0470
2 RX-0471
3 RX-0472
4 RX-0473
5 RX-0474
6 RX-0475
7 RX-0476
8 RX-0477
9 RX-0478
10 RX-0479
11 RX-0480
12 RX-0481
13 RX-0482
14 RX-0483
15 RX-0484
16 RX-0485
17 RX-0486
18 RX-0487
19 RX-0488
20 RX-0489
21 RX-0490
22 RX-0491
23 RX-0492
24 RX-0493
25 RX-0494

Heritage Reporting Corporation
(202) 628-4888

1 RX-0495
2 RX-0496
3 RX-0497
4 RX-0498
5 RX-0499
6 RX-0500
7 RX-0501
8 RX-0502
9 RX-0503
10 RX-0504
11 RX-0505
12 RX-0506
13 RX-0507
14 RX-0508
15 RX-0509
16 RX-0510
17 RX-0511
18 RX-0512C
19 RX-0513C
20 RX-0514
21 RX-0515C
22 RX-0516C
23 RX-0518C
24 RX-0519
25 RX-0522

Heritage Reporting Corporation
(202) 628-4888

1 RX-0523
2 RX-0524
3 RX-0525
4 RX-0526
5 RX-0527
6 RX-0528
7 RX-0529
8 RX-0531
9 RX-0533
10 RX-0534
11 RX-0535
12 RX-0536
13 RX-0537
14 RX-0538
15 RX-0539
16 RX-0540
17 RX-0541
18 RX-0543
19 RX-0546
20 RX-0548
21 RX-0549
22 RX-0551
23 RX-0553
24 RX-0554
25 RX-0555

Heritage Reporting Corporation
(202) 628-4888

1 RX-0556
2 RX-0564
3 RX-0565
4 RX-0574
5 RX-0576
6 RX-0577
7 RX-0578
8 RX-0590
9 RX-0592
10 RX-0593
11 RX-0604
12 RX-0605
13 RX-0606
14 RX-0607
15 RX-0608
16 RX-0609
17 RX-0610
18 RX-0611
19 RX-0612
20 RX-0613
21 RX-0616
22 RX-0642C
23 RX-0644C
24 RX-0655C
25 RX-0656C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0659C
2 RX-0669C
3 RX-0671C
4 RX-0673C
5 RX-0675C
6 RX-0676C
7 RX-0677C
8 RX-0685C
9 RX-0686C
10 RX-0689C
11 RX-0690C
12 RX-0691C
13 RX-0692C
14 RX-0693C
15 RX-0694C
16 RX-0696C
17 RX-0697C
18 RX-0699C
19 RX-0700C
20 RX-0701C
21 RX-0702
22 RX-0703
23 RX-0704
24 RX-0705
25 RX-0708C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0709
2 RX-0710C
3 RX-0711C
4 RX-0712C
5 RX-0713C
6 RX-0714C
7 RX-0715C
8 RX-0716C
9 RX-0717C
10 RX-0718C
11 RX-0719C
12 RX-0720C
13 RX-0721C
14 RX-0722C
15 RX-0723C
16 RX-0724C
17 RX-0725C
18 RX-0726C
19 RX-0727
20 RX-0729
21 RX-0730
22 RX-0731C
23 RX-0732C
24 RX-0733C
25 RX-0734C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0735C
2 RX-0739C
3 RX-0740C
4 RX-0741C
5 RX-0745
6 RX-0746
7 RX-0747
8 RX-0748
9 RX-0750
10 RX-0785
11 RX-0816
12 RX-0873C
13 RX-0874C
14 RX-0875C
15 RX-0876C
16 RX-0877C
17 RX-0878C
18 RX-0879C
19 RX-0880C
20 RX-0881C
21 RX-0882C
22 RX-0883C
23 RX-0884C
24 RX-0885C
25 RX-0886C

Heritage Reporting Corporation
(202) 628-4888

1 RX-0887C
2 RX-0888C
3 RX-0889C
4 RX-0890C
5 RX-0891C
6 RX-0892C
7 RX-0893C
8 RX-0894C
9 RX-0895C
10 RX-0896C
11 RX-0897C
12 RX-0898C
13 RX-0900C
14 RX-0902C
15 RX-0903C
16 RX-0904C
17 RX-0905C
18 RX-0906C
19 RX-0907
20 RX-0908
21 RX-0909
22 RX-0910
23 RX-0911
24 RX-0912
25 RX-0913

Heritage Reporting Corporation
(202) 628-4888

1 RX-0914
2 RX-0915C
3 RX-0916C
4 RX-0917C
5 RX-0918C
6 RX-0919C
7 RX-0920C
8 RX-0921C
9 RX-0922C
10 RX-0923
11 RX-0924
12 RX-0928C
13 RX-0929C
14 RX-0930C
15 RX-0931C
16 RX-0938C
17 RX-0939C
18 RX-0940
19 RX-0941
20 RX-0942
21 RX-0943
22 RX-0944
23 RX-0945
24 RX-0946
25 RX-0947

Heritage Reporting Corporation
(202) 628-4888

1 RX-0948
2 RX-0949
3 RX-0950
4 RX-0951
5 RX-0952
6 RX-0953
7 RX-0954
8 RX-0955
9 RX-0956
10 RX-0957
11 RX-0958
12 RX-0959
13 RX-0960
14 RX-0961
15 RX-0962
16 RX-0963
17 RX-0964
18 RX-0965
19 RX-0966
20 RX-0967
21 RX-0968
22 RX-0969
23 RX-0970
24 RX-0971
25 RX-0972

Heritage Reporting Corporation
(202) 628-4888

1 RX-0973
2 RX-0974
3 RX-0975
4 RX-0976
5 RX-0977
6 RX-0978
7 RX-0980
8 RX-0981
9 RX-0982
10 RX-0983
11 RX-0984
12 RX-0985
13 RX-0986
14 RX-0987
15 RX-0988
16 RX-0989
17 RX-0990
18 RX-0991
19 RX-0992
20 RX-0993
21 RX-0994
22 RX-0995
23 RX-0996
24 RX-0997
25 RX-0998

Heritage Reporting Corporation
(202) 628-4888

1 RX-0999
2 RX-1000
3 RX-1001
4 RX-1002
5 RX-1003
6 RX-1004
7 RX-1005
8 RX-1006
9 RX-1007
10 RX-1008
11 RX-1010
12 RX-1011
13 RX-1012
14 RX-1013
15 RX-1014
16 RX-1015
17 RX-1016
18 RX-1017
19 RX-1018
20 RX-1019
21 RX-1020
22 RX-1021
23 RX-1022
24 RX-1023
25 RX-1024

Heritage Reporting Corporation
(202) 628-4888

1 RX-1025
2 RX-1026
3 RX-1027
4 RX-1028
5 RX-1029
6 RX-1030
7 RX-1031
8 RX-1032C
9 RX-1033
10 RX-1034
11 RX-1035
12 RX-1036
13 RX-1037
14 RX-1038
15 RX-1039
16 RX-1040
17 RX-1041
18 RX-1042
19 RX-1043
20 RX-1044
21 RX-1045
22 RX-1046
23 RX-1047
24 RX-1048
25 RX-1050

Heritage Reporting Corporation
(202) 628-4888

1 RX-1051C
2 RX-1052
3 RX-1054
4 RX-1055C
5 RX-1056C
6 RX-1057C
7 RX-1058C
8 RX-1059C
9 RX-1060C
10 RX-1061C
11 RX-1062C
12 RX-1063C
13 RX-1064C
14 RX-1065C
15 RX-1067C
16 RX-1068C
17 RX-1069C
18 RX-1070C
19 RX-1071C
20 RX-1072C
21 RX-1073C
22 RX-1074
23 RX-1075
24 RX-1076
25 RX-1079

Heritage Reporting Corporation
(202) 628-4888

1 RX-1081C
2 RX-1082
3 RX-1086C
4 RX-1087
5 RX-1088
6 RX-1089
7 RX-1091C
8 RX-1092C
9 RX-1093C
10 RX-1094C
11 RX-1095C
12 RX-1096C
13 RX-1097C
14 RX-1098
15 RX-1099C
16 RX-1101C
17 RX-1103C
18 RX-1105C
19 RX-1106C
20 RX-1108C
21 RX-1109C
22 RX-1114C
23 RX-1115C
24 RX-1116C
25 RX-1117

Heritage Reporting Corporation
(202) 628-4888

1 RX-1118
2 RX-1119
3 RX-1120C
4 RX-1121C
5 RX-1122C
6 RX-1123C
7 RX-1124C
8 RX-1125C
9 RX-1126
10 RX-1127
11 RX-1128
12 RX-1129
13 RX-1130
14 RX-1132C
15 RX-1133C
16 RX-1134C
17 RX-1135
18 RX-1136
19 RX-1137
20 RX-1138
21 RX-1139C
22 RX-1140C
23 RX-1141C
24 RX-1142C
25 RX-1143C

Heritage Reporting Corporation
(202) 628-4888

1 RX-1144C
2 RX-1145C
3 RX-1146C
4 RX-1148C
5 RX-1149C
6 RX-1150
7 RX-1151
8 RX-1152
9 RX-1153
10 RX-1154
11 RX-1155C
12 RX-1156C
13 RX-1157C
14 RX-1158
15 RX-1159C
16 RX-1160
17 RX-1161
18 RX-1162
19 RX-1163
20 RX-1164
21 RX-1165
22 RX-1166
23 RX-1167
24 RX-1168
25 RX-1169

Heritage Reporting Corporation
(202) 628-4888

1 RX-1170
2 RX-1171
3 RX-1172
4 RX-1173
5 RX-1174
6 RX-1175
7 RX-1176
8 RX-1177
9 RX-1178
10 RX-1268
11 RX-1269C
12 RX-1270
13 RX-1271
14 RX-1272
15 RX-1274
16 RX-1275
17 RX-1276
18 RX-1277
19 RX-1279
20 RX-1280
21 RX-1283
22 RX-1284
23 RX-1286
24 RX-1289
25 RX-1290

Heritage Reporting Corporation
(202) 628-4888

1 RX-1291
2 RX-1294
3 RX-1295
4 RX-1296
5 RX-1297
6 RX-1298
7 RX-1299
8 RX-1301
9 RX-1302
10 RX-1303
11 RX-1304
12 RX-1305
13 RX-1306
14 RX-1307
15 RX-1308
16 RX-1309
17 RX-1310
18 RX-1311
19 RX-1312
20 RX-1314
21 RX-1318
22 RX-1319
23 RX-1320
24 RX-1321
25 RX-1322

Heritage Reporting Corporation
(202) 628-4888

1 RX-1323
2 RX-1324
3 RX-1325
4 RX-1326
5 RX-1327
6 RX-1328
7 RX-1329
8 RX-1330
9 RX-1331
10 RX-1332
11 RX-1333
12 RX-1334
13 RX-1335
14 RX-1336
15 RX-1337
16 RX-1338
17 RX-1339
18 RX-1340
19 RX-1341
20 RX-1342
21 RX-1343
22 RX-1344
23 RX-1345
24 RX-1346
25 RX-1348

Heritage Reporting Corporation
(202) 628-4888

1 RX-1349
2 RX-1350
3 RX-1351
4 RX-1352
5 RX-1353
6 RX-1354
7 RX-1355
8 RX-1356
9 RX-1357
10 RX-1358
11 RX-1359
12 RX-1360
13 RX-1361
14 RX-1362
15 RX-1363
16 RX-1364
17 RX-1365
18 RX-1366
19 RX-1367
20 RX-1368
21 RX-1369
22 RX-1370
23 RX-1371
24 RX-1372
25 RX-1373

Heritage Reporting Corporation
(202) 628-4888

1 RX-1374
2 RX-1375
3 RX-1376
4 RX-1377
5 RX-1378
6 RX-1379
7 RX-1380
8 RX-1381
9 RX-1382
10 RX-1383
11 RX-1384
12 RX-1385
13 RX-1386
14 RX-1387
15 RX-1388
16 RX-1389
17 RX-1390
18 RX-1391
19 RX-1392
20 RX-1393
21 RX-1394
22 RX-1395
23 RX-1396
24 RX-1397
25 RX-1398

Heritage Reporting Corporation
(202) 628-4888

1 RX-1399
2 RX-1400
3 RX-1401
4 RX-1402
5 RX-1403
6 RX-1404
7 RX-1405
8 RX-1406
9 RX-1407
10 RX-1408
11 RX-1409
12 RX-1410
13 RX-1411
14 RX-1412
15 RX-1413
16 RX-1414
17 RX-1415
18 RX-1416
19 RX-1417
20 RX-1418
21 RX-1419
22 RX-1420
23 RX-1421
24 RX-1423
25 RX-1424

Heritage Reporting Corporation
(202) 628-4888

1 RX-1425
2 RX-1426
3 RX-1427
4 RX-1428
5 RX-1429
6 RX-1430
7 RX-1431
8 RX-1432
9 RX-1433
10 RX-1434
11 RX-1435
12 RX-1436
13 RX-1437
14 RX-1438
15 RX-1439
16 RX-1440
17 RX-1441
18 RX-1444
19 RX-1445
20 RX-1446
21 RX-1447
22 RX-1448
23 RX-1449
24 RX-1450
25 RX-1451

Heritage Reporting Corporation
(202) 628-4888

1 RX-1452
2 RX-1453
3 RX-1454
4 RX-1455
5 RX-1456
6 RX-1457
7 RX-1458
8 RX-1459
9 RX-1460
10 RX-1461
11 RX-1462
12 RX-1463
13 RX-1464
14 RX-1465
15 RX-1466
16 RX-1467
17 RX-1468
18 RX-1469C
19 RX-1470C
20 RX-1473
21 RX-1474
22 RX-1475
23 RX-1476
24 RX-1477
25 RX-1486

Heritage Reporting Corporation
(202) 628-4888

1 RX-1488
2 RX-1489
3 RX-1490
4 RX-1491
5 RX-1492
6 RX-1493
7 RX-1494
8 RX-1495
9 RX-1497
10 RX-1499
11 RX-1501
12 RX-1502
13 RX-1503
14 RX-1504
15 RX-1505
16 RX-1506
17 RX-1507
18 RX-1508
19 RX-1509
20 RX-1510
21 RX-1511
22 RX-1512
23 RX-1513
24 RX-1514
25 RX-1515

Heritage Reporting Corporation
(202) 628-4888

1 RX-1516
2 RX-1517
3 RX-1518
4 RX-1519
5 RX-1520
6 RX-1521
7 RX-1522
8 RX-1523
9 RX-1524
10 RX-1525
11 RX-1526
12 RX-1527
13 RX-1529
14 RX-1530
15 RX-1531
16 RX-1532
17 RX-1534
18 RX-1535
19 RX-1536
20 RX-1537
21 RX-1538
22 RX-1539
23 RX-1540
24 RX-1541
25 RX-1542

Heritage Reporting Corporation
(202) 628-4888

1 RX-1543
2 RX-1544
3 RX-1545
4 RX-1546
5 RX-1547
6 RX-1548
7 RX-1549
8 RX-1550
9 RX-1551
10 RX-1552
11 RX-1553
12 RX-1554
13 RX-1555
14 RX-1556
15 RX-1557
16 RX-1558
17 RX-1559
18 RX-1560
19 RX-1561
20 RX-1562
21 RX-1563
22 RX-1564
23 RX-1565
24 RX-1566
25 RX-1567

Heritage Reporting Corporation
(202) 628-4888

1 RX-1568
2 RX-1569
3 RX-1570
4 RX-1571
5 RX-1572
6 RX-1573
7 RX-1574
8 RX-1575
9 RX-1576
10 RX-1577
11 RX-1578
12 RX-1579
13 RX-1580
14 RX-1581
15 RX-1582
16 RX-1583
17 RX-1584
18 RX-1585
19 RX-1586
20 RX-1587
21 RX-1588
22 RX-1589
23 RX-1590
24 RX-1591
25 RX-1592

Heritage Reporting Corporation
(202) 628-4888

1 RX-1593
2 RX-1594
3 RX-1595
4 RX-1596
5 RX-1597
6 RX-1598
7 RX-1599
8 RX-1600
9 RX-1601
10 RX-1602
11 RX-1603
12 RX-1604
13 RX-1605
14 RX-1606
15 RX-1607
16 RX-1608
17 RX-1609
18 RX-1610
19 RX-1611
20 RX-1612
21 RX-1613
22 RX-1614
23 RX-1615
24 RX-1616
25 RX-1617

Heritage Reporting Corporation
(202) 628-4888

1 RX-1618
2 RX-1619
3 RX-1620
4 RX-1621
5 RX-1622
6 RX-1623
7 RX-1624
8 RX-1625
9 RX-1626
10 RX-1627
11 RX-1628
12 RX-1629
13 RX-1630
14 RX-1632
15 RX-1633
16 RX-1634
17 RX-1635
18 RX-1636
19 RX-1637
20 RX-1638
21 RX-1639
22 RX-1640
23 RX-1641
24 RX-1642
25 RX-1643

Heritage Reporting Corporation
(202) 628-4888

1 RX-1644
2 RX-1645
3 RX-1646
4 RX-1647
5 RX-1648
6 RX-1649
7 RX-1650
8 RX-1651
9 RX-1652
10 RX-1653
11 RX-1654
12 RX-1655
13 RX-1656
14 RX-1657
15 RX-1658
16 RX-1659
17 RX-1660
18 RX-1661
19 RX-1662
20 RX-1663
21 RX-1664
22 RX-1665
23 RX-1666
24 RX-1667
25 RX-1668

Heritage Reporting Corporation
(202) 628-4888

1 RX-1669
2 RX-1670
3 RX-1671
4 RX-1672
5 RX-1673
6 RX-1674
7 RX-1675
8 RX-1676
9 RX-1677
10 RX-1678
11 RX-1679
12 RX-1680
13 RX-1681
14 RX-1682
15 RX-1683
16 RX-1684
17 RX-1685C
18 RX-1686C
19 RX-1687
20 RX-1688
21 RX-1689
22 RX-1690
23 RX-1691
24 RX-1692
25 RX-1693

Heritage Reporting Corporation
(202) 628-4888

1 RX-1695
2 RX-1696
3 RX-1697
4 RX-1698C
5 RX-1699C
6 RX-1700
7 RX-1701
8 RX-1703
9 RX-1704
10 RX-1705
11 RX-1706C
12 RX-1707C
13 RX-1708C
14 RX-1709C
15 RX-1710
16 RX-1711
17 RX-1712
18 RX-1713
19 RX-1714
20 RX-1715
21 RX-1716
22 RX-1916C
23 RX-1918C
24 RX-1919
25 RX-1920

Heritage Reporting Corporation
(202) 628-4888

1 RX-1921
2 RX-1922
3 RX-1924C
4 RX-1925C
5 RX-1969
6 RX-1979C
7 RX-1980C
8 RX-1981C
9 RX-1982C
10 RX-1983C
11 RX-1986C
12 RX-1987C
13 RX-1990C
14 RX-1991C
15 RX-1992C
16 RX-2023
17 RX-2024
18 RX-2025C
19 RX-2027
20 RX-2028C
21 RX-2029C
22 RX-2030C
23 RX-2031C
24 RX-2032C
25 RX-2033C

Heritage Reporting Corporation
(202) 628-4888

1 RX-2034C
2 RX-2036
3 RX-2037
4 RX-2038
5 RX-2039
6 RX-2040
7 RX-2041
8 RX-2042
9 RX-2043
10 RX-2044
11 RX-2045
12 RX-2046
13 RX-2047
14 RX-2048
15 RX-2050C
16 RX-2051C
17 RX-2052C
18 RX-2053C
19 RX-2054C
20 RX-2055C
21 RX-2056C
22 RX-2057C
23 RX-2058C
24 RX-2059C
25 RX-2060C

Heritage Reporting Corporation
(202) 628-4888

1 RX-2061C
2 RX-2062C
3 RX-2063C
4 RX-2064C
5 RX-2065C
6 RX-2066C
7 RX-2067C
8 RX-2068C
9 RX-2069C
10 RX-2070C
11 RX-2071C
12 RX-2072C
13 RX-2073C
14 RX-2074C
15 RX-2075C
16 RX-2076C
17 RX-2077C
18 RX-2078C
19 RX-2079C
20 RX-2080C
21 RX-2081C
22 RX-2082C
23 RX-2083C
24 RX-2084C
25 RX-2085C

Heritage Reporting Corporation
(202) 628-4888

1 RX-2086C
2 RX-2087C
3 RX-2088C
4 RX-2089C
5 RX-2090C
6 RX-2091C
7 RX-2092C
8 RX-2093C
9 RX-2094C
10 RX-2095C
11 RX-2096C
12 RX-2097C
13 RX-2098C
14 RX-2099C
15 RX-2100C
16 RX-2101C
17 RX-2102C
18 RX-2103C
19 RX-2104C
20 RX-2105C
21 RX-2106C
22 RX-2107C
23 RX-2108C
24 RX-2109C
25 RX-2110C

Heritage Reporting Corporation
(202) 628-4888

1 RX-2111C
2 RX-2112C
3 RX-2113C
4 RX-2114C
5 RX-2115C
6 RX-2116C
7 RX-2117C
8 RX-2118C
9 RX-2119C
10 RX-2120C
11 RX-2121C
12 RX-2122
13 RX-2123
14 RX-2124
15 RX-2125
16 RX-2126
17 RX-2127
18 RX-2128
19 RX-2129
20 RX-2130
21 RX-2131
22 RX-2132
23 RX-2133
24 RX-2134
25 RX-2135

Heritage Reporting Corporation
(202) 628-4888

1 RX-2136
2 RX-2137
3 RX-2138
4 RX-2139C
5 RX-2140C
6 RX-2141C
7 RX-2142C
8 RX-2143C
9 RX-2144C
10 RX-2145C
11 RX-2146C
12 RX-2147C
13 RX-2148C
14 RX-2149C
15 RX-2150C
16 RX-2151C
17 RX-2152C
18 RX-2153C
19 RX-2158C
20 RX-2159C
21 RX-2160C
22 RX-2161C
23 RX-2162C
24 RX-2163C
25 RX-2164C

Heritage Reporting Corporation
(202) 628-4888

1 RX-2165C
2 RX-2166C
3 RX-2167C
4 RX-2168C
5 RX-2169C
6 RX-2170C
7 RX-2171C
8 RX-2172C
9 RX-2173C
10 RX-2174C
11 RX-2175C
12 RX-2176C
13 RX-2177C
14 RX-2178C
15 RX-2180C
16 RX-2181C
17 RX-2182C
18 RX-2183C
19 RX-2184C
20 RX-2185C
21 RX-2186C
22 RX-2187C
23 RX-2188C
24 RX-2189C
25 RX-2190C

Heritage Reporting Corporation
(202) 628-4888

1 RX-2191C
2 RX-2192C
3 RX-2193C
4 RX-2194C
5 RX-2195C
6 RX-2196C
7 RX-2197C
8 RX-2198C
9 RX-2199C
10 RX-2200C
11 RX-2201C
12 RX-2202C
13 RX-2203C
14 RX-2204C
15 RX-2205C
16 RX-2206C
17 RX-2207C
18 RX-2209
19 RX-2210C
20 RX-2211
21 RX-2215
22 RX-2216
23 RX-2217
24 RX-2218
25 RX-2219

Heritage Reporting Corporation
(202) 628-4888

1 RX-2220
2 RX-2221
3 RX-2222
4 RX-2223
5 RX-2224
6 RX-2225
7 RX-2226
8 RX-2227
9 RX-2228
10 RX-2229
11 RX-2230
12 RX-2231
13 RX-2232
14 RX-2233
15 RX-2234
16 RX-2235
17 RX-2236
18 RX-2237
19 RX-2238
20 RX-2239
21 RX-2240
22 RX-2241
23 RX-2242
24 RX-2243
25 RX-2244

Heritage Reporting Corporation
(202) 628-4888

1 RX-2245
2 RX-2246
3 RX-2248
4 RX-2249
5 RX-2250
6 RX-2268C
7 RX-2269
8 RX-2270
9 RX-2271
10 RX-2272
11 RX-2273
12 RX-2274
13 RX-2275
14 RX-2276
15 RX-2277
16 RX-2278
17 RX-2279
18 RX-2280
19 RX-2281
20 RX-2282
21 RX-2283
22 RX-2284
23 RX-2285
24 RX-2286
25 RX-2287

Heritage Reporting Corporation
(202) 628-4888

1 RX-2288
2 RX-2289
3 RX-2290
4 RX-2291
5 RX-2292
6 RX-2293
7 RX-2294
8 RX-2295
9 RX-2296
10 RX-2297
11 RX-2298
12 RX-2299
13 RX-2300
14 RX-2301
15 RX-2302
16 RX-2303
17 RX-2304
18 RX-2305
19 RX-2306
20 RX-2307
21 RX-2308
22 RX-2309
23 RX-2310
24 RX-2311
25 RX-2312

Heritage Reporting Corporation
(202) 628-4888

1 RX-2313
2 RX-2314
3 RX-2315
4 RX-2316
5 RX-2317
6 RX-2318
7 RX-2319
8 RX-2320
9 RX-2321
10 RX-2322
11 RX-2323
12 RX-2324
13 RX-2325
14 RX-2326
15 RX-2327
16 RX-2328
17 RX-2329
18 RX-2330
19 RX-2331
20 RX-2332
21 RX-2333
22 RX-2334
23 RX-2335
24 RX-2336
25 RX-2337

Heritage Reporting Corporation
(202) 628-4888

1 RX-2338
2 RX-2339
3 RX-2340
4 RX-2341
5 RX-2342
6 RX-2343
7 RX-2344
8 RX-2345
9 RX-2346
10 RX-2347
11 RX-2348
12 RX-2349
13 RX-2350
14 RX-2351
15 RX-2352
16 RX-2353
17 RX-2354
18 RX-2355
19 RX-2356
20 RX-2357
21 RX-2358
22 RX-2359
23 RX-2360
24 RX-2361
25 RX-2362

Heritage Reporting Corporation
(202) 628-4888

1 RX-2363
2 RX-2364
3 RX-2365
4 RX-2366
5 RX-2367
6 RX-2368
7 RX-2369
8 RX-2370
9 RX-2371
10 RX-2372
11 RX-2373
12 RX-2374
13 RX-2375
14 RX-2376
15 RX-2377
16 RX-2378
17 RX-2379
18 RX-2380
19 RX-2381
20 RX-2382
21 RX-2383
22 RX-2384
23 RX-2385
24 RX-2386
25 RX-2387

Heritage Reporting Corporation
(202) 628-4888

1 RX-2388
2 RX-2389
3 RX-2390
4 RX-2391
5 RX-2392
6 RX-2393
7 RX-2394
8 RX-2395
9 RX-2396
10 RX-2397
11 RX-2398
12 RX-2399
13 RX-2400
14 RX-2401
15 RX-2402
16 RX-2403
17 RX-2404
18 RX-2405
19 RX-2406
20 RX-2407
21 RX-2408
22 RX-2409
23 RX-2410
24 RX-2411
25 RX-2412

Heritage Reporting Corporation
(202) 628-4888

1 RX-2413
2 RX-2414
3 RX-2415
4 RX-2416
5 RX-2417
6 RX-2418
7 RX-2419
8 RX-2420
9 RX-2421
10 RX-2422
11 RX-2423
12 RX-2424
13 RX-2425
14 RX-2426
15 RX-2427
16 RX-2428
17 RX-2429
18 RX-2430
19 RX-2431
20 RX-2432
21 RX-2433
22 RX-2434
23 RX-2435
24 RX-2436
25 RX-2437

Heritage Reporting Corporation
(202) 628-4888

1 RX-2438
2 RX-2439
3 RX-2440
4 RX-2441
5 RX-2442
6 RX-2443
7 RX-2444
8 RX-2445
9 RX-2446
10 RX-2447
11 RX-2448
12 RX-2449
13 RX-2450
14 RX-2451
15 RX-2452
16 RX-2453
17 RX-2454
18 RX-2455
19 RX-2456
20 RX-2457
21 RX-2458
22 RX-2459
23 RX-2460
24 RX-2461
25 RX-2462

Heritage Reporting Corporation
(202) 628-4888

1 RX-2463
2 RX-2464
3 RX-2465
4 RX-2466
5 RX-2467
6 RX-2468
7 RX-2469
8 RX-2470
9 RX-2471
10 RX-2472
11 RX-2473
12 RX-2474
13 RX-2475
14 RX-2476
15 RX-2477
16 RX-2478
17 RX-2479
18 RX-2480
19 RX-2481
20 RX-2482
21 RX-2483
22 RX-2484
23 RX-2485
24 RX-2486
25 RX-2487

Heritage Reporting Corporation
(202) 628-4888

1 RX-2488
2 RX-2489
3 RX-2490
4 RX-2491
5 RX-2492
6 RX-2493
7 RX-2494
8 RX-2495
9 RX-2496
10 RX-2497
11 RX-2498
12 RX-2499
13 RX-2500
14 RX-2501
15 RX-2502
16 RX-2503
17 RX-2504
18 RX-2505
19 RX-2506
20 RX-2507
21 RX-2508
22 RX-2509
23 RX-2510
24 RX-2511
25 RX-2512

Heritage Reporting Corporation
(202) 628-4888

1 RX-2513
2 RX-2514
3 RX-2515
4 RX-2516
5 RX-2517
6 RX-2518
7 RX-2519
8 RX-2520
9 RX-2521
10 RX-2522
11 RX-2523
12 RX-2524
13 RX-2525
14 RX-2526
15 RX-2527
16 RX-2528
17 RX-2529
18 RX-2530
19 RX-2531
20 RX-2532
21 RX-2533
22 RX-2534
23 RX-2535
24 RX-2536
25 RX-2537

Heritage Reporting Corporation
(202) 628-4888

1 RX-2538
2 RX-2539
3 RX-2540
4 RX-2541
5 RX-2542
6 RX-2543
7 RX-2544
8 RX-2545
9 RX-2546
10 RX-2547
11 RX-2548
12 RX-2549
13 RX-2550
14 RX-2551
15 RX-2552
16 RX-2553
17 RX-2554
18 RX-2555
19 RX-2556
20 RX-2557
21 RX-2558
22 RX-2559
23 RX-2560
24 RX-2561
25 RX-2562

Heritage Reporting Corporation
(202) 628-4888

1 RX-2563
2 RX-2564
3 RX-2565
4 RX-2566
5 RX-2567
6 RX-2568
7 RX-2569
8 RX-2570
9 RX-2571
10 RX-2572
11 RX-2573
12 RX-2574
13 RX-2575
14 RX-2576
15 RX-2577
16 RX-2578
17 RX-2579
18 RX-2580
19 RX-2581
20 RX-2582
21 RX-2583
22 RX-2584
23 RX-2585
24 RX-2586
25 RX-2587

Heritage Reporting Corporation
(202) 628-4888

1 RX-2588
2 RX-2589
3 RX-2590
4 RX-2591
5 RX-2592
6 RX-2593
7 RX-2594
8 RX-2595
9 RX-2596
10 RX-2597
11 RX-2598
12 RX-2599
13 RX-2600
14 RX-2601
15 RX-2602
16 RX-2603
17 RX-2604
18 RX-2605
19 RX-2606
20 RX-2607
21 RX-2608
22 RX-2609
23 RX-2610
24 RX-2611
25 RX-2612

Heritage Reporting Corporation
(202) 628-4888

1 RX-2613
2 RX-2614
3 RX-2615
4 RX-2616
5 RX-2617
6 RX-2618
7 RX-2619
8 RX-2620
9 RX-2621
10 RX-2622
11 RX-2623
12 RX-2624
13 RX-2625
14 RX-2626
15 RX-2627
16 RX-2628
17 RX-2629
18 RX-2630
19 RX-2631
20 RX-2632
21 RX-2633
22 RX-2634
23 RX-2635
24 RX-2636
25 RX-2637

Heritage Reporting Corporation
(202) 628-4888

1 RX-2638
2 RX-2639
3 RX-2640
4 RX-2641
5 RX-2642
6 RX-2643
7 RX-2644
8 RX-2645
9 RX-2646
10 RX-2647
11 RX-2648
12 RX-2649
13 RX-2650
14 RX-2651
15 RX-2652
16 RX-2653
17 RX-2654
18 RX-2655
19 RX-2656
20 RX-2657
21 RX-2658
22 RX-2659
23 RX-2660
24 RX-2661
25 RX-2662

Heritage Reporting Corporation
(202) 628-4888

1 RX-2663
2 RX-2664
3 RX-2665
4 RX-2666
5 RX-2667
6 RX-2668
7 RX-2669
8 RX-2670
9 RX-2671
10 RX-2672
11 RX-2673
12 RX-2674
13 RX-2675
14 RX-2676
15 RX-2677
16 RX-2678
17 RX-2679
18 RX-2680
19 RX-2681
20 RX-2682
21 RX-2683
22 RX-2684
23 RX-2685
24 RX-2686
25 RX-2687

Heritage Reporting Corporation
(202) 628-4888

1 RX-2688
2 RX-2689
3 RX-2690
4 RX-2691
5 RX-2692
6 RX-2693
7 RX-2694
8 RX-2695
9 RX-2696
10 RX-2697
11 RX-2698
12 RX-2699
13 RX-2700
14 RX-2701
15 RX-2702
16 RX-2703
17 RX-2704
18 RX-2705
19 RX-2706
20 RX-2707
21 RX-2708
22 RX-2709
23 RX-2710
24 RX-2711
25 RX-2712

Heritage Reporting Corporation
(202) 628-4888

1 RX-2713
2 RX-2714
3 RX-2715
4 RX-2716
5 RX-2717
6 RX-2718
7 RX-2719
8 RX-2720
9 RX-2721
10 RX-2722
11 RX-2723
12 RX-2724
13 RX-2725
14 RX-2726
15 RX-2727
16 RX-2728
17 RX-2729
18 RX-2730
19 RX-2731
20 RX-2732
21 RX-2733
22 RX-2734
23 RX-2735
24 RX-2736
25 RX-2737

Heritage Reporting Corporation
(202) 628-4888

1 RX-2738
2 RX-2739
3 RX-2740
4 RX-2741
5 RX-2742
6 RX-2743
7 RX-2744
8 RX-2745
9 RX-2746
10 RX-2747
11 RX-2748
12 RX-2749
13 RX-2750
14 RX-2751
15 RX-2752
16 RX-2753
17 RX-2754
18 RX-2755
19 RX-2756
20 RX-2757
21 RX-2758
22 RX-2759
23 RX-2760
24 RX-2761
25 RX-2762

Heritage Reporting Corporation
(202) 628-4888

1 RX-2763
2 RX-2764
3 RX-2765
4 RX-2766
5 RX-2767
6 RX-2768
7 RX-2769
8 RX-2770
9 RX-2771
10 RX-2772
11 RX-2773
12 RX-2774
13 RX-2775
14 RX-2776
15 RX-2777
16 RX-2778
17 RX-2779
18 RX-2780
19 RX-2781
20 RX-2782
21 RX-2783
22 RX-2784
23 RX-2785
24 RX-2786
25 RX-2787

Heritage Reporting Corporation
(202) 628-4888

1 RX-2788
2 RX-2789
3 RX-2790
4 RX-2791
5 RX-2792
6 RX-2793
7 RX-2794
8 RX-2795
9 RX-2796
10 RX-2797
11 RX-2798
12 RX-2799
13 RX-2800
14 RX-2801
15 RX-2802
16 RX-2803
17 RX-2804
18 RX-2805
19 RX-2806
20 RX-2807
21 RX-2808
22 RX-2809
23 RX-2810
24 RX-2811
25 RX-2812

Heritage Reporting Corporation
(202) 628-4888

1 RX-2813
2 RX-2814
3 RX-2815
4 RX-2816
5 RX-2817
6 RX-2818
7 RX-2819
8 RX-2820
9 RX-2821
10 RX-2822
11 RX-2823
12 RX-2824
13 RX-2825
14 RX-2826
15 RX-2827
16 RX-2828
17 RX-2829
18 RX-2830
19 RX-2831
20 RX-2832
21 RX-2833
22 RX-2834
23 RX-2835
24 RX-2836
25 RX-2837

Heritage Reporting Corporation
(202) 628-4888

1 RX-2838
2 RX-2839
3 RX-2840
4 RX-2841
5 RX-2842
6 RX-2843
7 RX-2844
8 RX-2845
9 RX-2846
10 RX-2847
11 RX-2848
12 RX-2849
13 RX-2850
14 RX-2851
15 RX-2852
16 RX-2853
17 RX-2854
18 RX-2855
19 RX-2856
20 RX-2857
21 RX-2858
22 RX-2859
23 RX-2860
24 RX-2861
25 RX-2862

Heritage Reporting Corporation
(202) 628-4888

1 RX-2863
2 RX-2864
3 RX-2865
4 RX-2866
5 RX-2867
6 RX-2868
7 RX-2869
8 RX-2870
9 RX-2871
10 RX-2872
11 RX-2873
12 RX-2874
13 RX-2875
14 RX-2876
15 RX-2877
16 RX-2878
17 RX-2879
18 RX-2880
19 RX-2881
20 RX-2882
21 RX-2883
22 RX-2884
23 RX-2885
24 RX-2886
25 RX-2887

Heritage Reporting Corporation
(202) 628-4888

1 RX-2888
2 RX-2889
3 RX-2890
4 RX-2891
5 RX-2892
6 RX-2893
7 RX-2894
8 RX-2895
9 RX-2896C
10 RX-2897C
11 RX-2898C
12 RX-2899C
13 RX-2900C
14 RX-2901C
15 RX-2902C
16 RX-2903C
17 RX-2904C
18 RX-2905C
19 RX-2906C
20 RX-2907C
21 RX-2908C
22 RX-2909C
23 RX-2910C
24 RX-2911C
25 RX-2912C

Heritage Reporting Corporation
(202) 628-4888

1 RX-2913C
2 RX-2914C
3 RX-2915C
4 RX-2916C
5 RX-2917C
6 RX-2918C
7 RX-2919C
8 RX-2920C
9 RX-2921C
10 RX-2922C
11 RX-2923C
12 RX-2924C
13 RX-2925C
14 RX-2926C
15 RX-2927C
16 RX-2928C
17 RX-2929C
18 RX-2930C
19 RX-2931C
20 RX-2932C
21 RX-2933C
22 RX-2934C
23 RX-2935C
24 RX-2936C
25 RX-2937C

Heritage Reporting Corporation
(202) 628-4888

1 RX-2938C
2 RX-2939C
3 RX-2940C
4 RX-2941C
5 RX-2942C
6 RX-2943C
7 RX-2944C
8 RX-2945C
9 RX-2946C
10 RX-2947C
11 RX-2948C
12 RX-2949C
13 RX-2950C
14 RX-2951C
15 RX-2952C
16 RX-2953C
17 RX-2954C
18 RX-2955C
19 RX-2956C
20 RX-2957C
21 RX-2958C
22 RX-2959C
23 RX-2960C
24 RX-2961C
25 RX-2962C

Heritage Reporting Corporation
(202) 628-4888

1 RX-2963C
2 RX-2964C
3 RX-2965C
4 RX-2966C
5 RX-2967C
6 RX-2968C
7 RX-2969C
8 RX-2970C
9 RX-2971C
10 RX-2972C
11 RX-2973C
12 RX-2974C
13 RX-2975C
14 RX-2976C
15 RX-2977C
16 RX-2978C
17 RX-2979C
18 RX-2980C
19 RX-2981C
20 RX-2982C
21 RX-2983C
22 RX-2984C
23 RX-2985C
24 RX-2986C
25 RX-2987C

Heritage Reporting Corporation
(202) 628-4888

1 RX-2988C
2 RX-2989C
3 RX-2990C
4 RX-2991C
5 RX-2992C
6 RX-2993C
7 RX-2994C
8 RX-2995C
9 RX-2996C
10 RX-2997C
11 RX-2998C
12 RX-2999C
13 RX-3000C
14 RX-3001C
15 RX-3002C
16 RX-3003C
17 RX-3004C
18 RX-3005C
19 RX-3006C
20 RX-3007C
21 RX-3008C
22 RX-3009C
23 RX-3010C
24 RX-3011C
25 RX-3012C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3013C
2 RX-3014C
3 RX-3015C
4 RX-3016C
5 RX-3017C
6 RX-3018C
7 RX-3019C
8 RX-3020C
9 RX-3021C
10 RX-3022C
11 RX-3023C
12 RX-3024C
13 RX-3025C
14 RX-3026C
15 RX-3027C
16 RX-3028C
17 RX-3029C
18 RX-3030C
19 RX-3031C
20 RX-3032C
21 RX-3033C
22 RX-3034C
23 RX-3035C
24 RX-3036C
25 RX-3037C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3038C
2 RX-3039C
3 RX-3040C
4 RX-3041C
5 RX-3042C
6 RX-3043C
7 RX-3044C
8 RX-3045C
9 RX-3046C
10 RX-3047C
11 RX-3048C
12 RX-3049C
13 RX-3050C
14 RX-3051C
15 RX-3052C
16 RX-3053C
17 RX-3054C
18 RX-3055C
19 RX-3056C
20 RX-3057C
21 RX-3058C
22 RX-3059C
23 RX-3060C
24 RX-3061C
25 RX-3062C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3063C
2 RX-3064C
3 RX-3065C
4 RX-3066C
5 RX-3067C
6 RX-3068C
7 RX-3069C
8 RX-3070C
9 RX-3071C
10 RX-3072C
11 RX-3073C
12 RX-3074C
13 RX-3075C
14 RX-3153C
15 RX-3154C
16 RX-3155C
17 RX-3156C
18 RX-3157C
19 RX-3158C
20 RX-3159C
21 RX-3160C
22 RX-3161C
23 RX-3162C
24 RX-3163C
25 RX-3164C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3165C
2 RX-3166C
3 RX-3167C
4 RX-3168C
5 RX-3169C
6 RX-3170C
7 RX-3171C
8 RX-3172C
9 RX-3173C
10 RX-3174C
11 RX-3175C
12 RX-3176C
13 RX-3177C
14 RX-3178C
15 RX-3179C
16 RX-3180C
17 RX-3181C
18 RX-3182C
19 RX-3183C
20 RX-3184C
21 RX-3185C
22 RX-3186C
23 RX-3187C
24 RX-3188C
25 RX-3189C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3190C
2 RX-3191C
3 RX-3192C
4 RX-3193C
5 RX-3194C
6 RX-3195C
7 RX-3196C
8 RX-3197C
9 RX-3198C
10 RX-3199C
11 RX-3200C
12 RX-3201C
13 RX-3202C
14 RX-3205
15 RX-3207
16 RX-3208
17 RX-3209
18 RX-3210
19 RX-3212C
20 RX-3213C
21 RX-3215C
22 RX-3216C
23 RX-3217C
24 RX-3218C
25 RX-3219

Heritage Reporting Corporation
(202) 628-4888

1 RX-3220
2 RX-3223C
3 RX-3224C
4 RX-3225C
5 RX-3227C
6 RX-3228C
7 RX-3229C
8 RX-3230C
9 RX-3231C
10 RX-3232C
11 RX-3233C
12 RX-3234C
13 RX-3235C
14 RX-3236C
15 RX-3237C
16 RX-3238C
17 RX-3239C
18 RX-3240C
19 RX-3241C
20 RX-3242C
21 RX-3243C
22 RX-3244C
23 RX-3245C
24 RX-3246C
25 RX-3247C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3248C
2 RX-3249C
3 RX-3250C
4 RX-3251C
5 RX-3252C
6 RX-3253C
7 RX-3254C
8 RX-3256
9 RX-3257
10 RX-3258
11 RX-3259
12 RX-3260C
13 RX-3262C
14 RX-3263
15 RX-3264
16 RX-3265
17 RX-3275
18 RX-3276
19 RX-3277
20 RX-3278
21 RX-3279
22 RX-3284C
23 RX-3285C
24 RX-3286
25 RX-3287

Heritage Reporting Corporation
(202) 628-4888

1 RX-3288C
2 RX-3290
3 RX-3291
4 RX-3295
5 RX-3296
6 RX-3297
7 RX-3299
8 RX-3300
9 RX-3301C
10 RX-3302C
11 RX-3303
12 RX-3304
13 RX-3305
14 RX-3306
15 RX-3307
16 RX-3308
17 RX-3309
18 RX-3310
19 RX-3311
20 RX-3312C
21 RX-3313
22 RX-3314
23 RX-3315
24 RX-3318
25 RX-3319

Heritage Reporting Corporation
(202) 628-4888

1 RX-3320
2 RX-3321
3 RX-3322
4 RX-3323
5 RX-3324
6 RX-3325
7 RX-3326
8 RX-3327
9 RX-3328
10 RX-3329
11 RX-3330
12 RX-3331
13 RX-3332
14 RX-3333
15 RX-3334
16 RX-3335
17 RX-3336
18 RX-3337
19 RX-3338
20 RX-3339
21 RX-3340
22 RX-3341
23 RX-3342
24 RX-3343
25 RX-3344

Heritage Reporting Corporation
(202) 628-4888

1 RX-3493
2 RX-3495
3 RX-3496
4 RX-3498
5 RX-3499
6 RX-3500
7 RX-3501
8 RX-3503
9 RX-3504
10 RX-3505
11 RX-3506
12 RX-3507
13 RX-3508
14 RX-3509
15 RX-3510
16 RX-3511
17 RX-3512
18 RX-3513
19 RX-3514
20 RX-3516
21 RX-3517
22 RX-3518
23 RX-3519
24 RX-3520
25 RX-3521

Heritage Reporting Corporation
(202) 628-4888

1 RX-3522
2 RX-3523
3 RX-3524
4 RX-3525
5 RX-3526
6 RX-3527
7 RX-3528
8 RX-3529
9 RX-3530
10 RX-3531
11 RX-3532
12 RX-3533
13 RX-3534
14 RX-3535
15 RX-3536
16 RX-3537C
17 RX-3538C
18 RX-3539C
19 RX-3540C
20 RX-3541C
21 RX-3542C
22 RX-3543C
23 RX-3544C
24 RX-3545C
25 RX-3546C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3547C
2 RX-3548C
3 RX-3549C
4 RX-3550C
5 RX-3551C
6 RX-3552C
7 RX-3553C
8 RX-3554C
9 RX-3555C
10 RX-3556C
11 RX-3557C
12 RX-3558C
13 RX-3559C
14 RX-3560C
15 RX-3561C
16 RX-3562C
17 RX-3563C
18 RX-3564C
19 RX-3565C
20 RX-3566C
21 RX-3567C
22 RX-3568C
23 RX-3569C
24 RX-3570C
25 RX-3571C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3572C
2 RX-3573C
3 RX-3574C
4 RX-3575C
5 RX-3576C
6 RX-3577C
7 RX-3578C
8 RX-3579C
9 RX-3580C
10 RX-3581C
11 RX-3582C
12 RX-3583C
13 RX-3584C
14 RX-3585C
15 RX-3586C
16 RX-3587C
17 RX-3588C
18 RX-3589C
19 RX-3590C
20 RX-3591C
21 RX-3592C
22 RX-3593C
23 RX-3594C
24 RX-3595C
25 RX-3596C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3597C
2 RX-3598C
3 RX-3599C
4 RX-3600C
5 RX-3601C
6 RX-3602C
7 RX-3603C
8 RX-3604C
9 RX-3605C
10 RX-3606C
11 RX-3607C
12 RX-3608C
13 RX-3609C
14 RX-3610C
15 RX-3611C
16 RX-3612C
17 RX-3613C
18 RX-3614C
19 RX-3615C
20 RX-3616C
21 RX-3617C
22 RX-3618C
23 RX-3619C
24 RX-3620C
25 RX-3621C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3622C
2 RX-3623C
3 RX-3624C
4 RX-3625C
5 RX-3626C
6 RX-3627C
7 RX-3628C
8 RX-3629C
9 RX-3630C
10 RX-3631C
11 RX-3632C
12 RX-3633C
13 RX-3634C
14 RX-3635C
15 RX-3636C
16 RX-3637C
17 RX-3638C
18 RX-3639C
19 RX-3640C
20 RX-3641C
21 RX-3642C
22 RX-3643C
23 RX-3644C
24 RX-3645C
25 RX-3646C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3647C
2 RX-3648C
3 RX-3649C
4 RX-3650C
5 RX-3651C
6 RX-3652C
7 RX-3653C
8 RX-3654C
9 RX-3655C
10 RX-3656C
11 RX-3657C
12 RX-3658C
13 RX-3659C
14 RX-3660C
15 RX-3661C
16 RX-3662C
17 RX-3663C
18 RX-3664C
19 RX-3665C
20 RX-3666C
21 RX-3667C
22 RX-3668C
23 RX-3669C
24 RX-3670C
25 RX-3671C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3672C
2 RX-3673C
3 RX-3674C
4 RX-3675C
5 RX-3676C
6 RX-3677C
7 RX-3678C
8 RX-3679C
9 RX-3680C
10 RX-3681C
11 RX-3682C
12 RX-3683C
13 RX-3684C
14 RX-3685C
15 RX-3686C
16 RX-3687C
17 RX-3688C
18 RX-3689C
19 RX-3690C
20 RX-3691C
21 RX-3692C
22 RX-3693C
23 RX-3694C
24 RX-3695C
25 RX-3696C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3697C
2 RX-3698C
3 RX-3699C
4 RX-3700C
5 RX-3701C
6 RX-3702C
7 RX-3703C
8 RX-3704C
9 RX-3705C
10 RX-3706C
11 RX-3707C
12 RX-3708C
13 RX-3709C
14 RX-3710C
15 RX-3711C
16 RX-3712C
17 RX-3713C
18 RX-3714C
19 RX-3715C
20 RX-3716C
21 RX-3717C
22 RX-3718C
23 RX-3719C
24 RX-3720C
25 RX-3721C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3722C
2 RX-3723C
3 RX-3724C
4 RX-3725C
5 RX-3726C
6 RX-3727C
7 RX-3728C
8 RX-3729C
9 RX-3730C
10 RX-3731C
11 RX-3732C
12 RX-3733C
13 RX-3734C
14 RX-3735C
15 RX-3736C
16 RX-3737C
17 RX-3738C
18 RX-3739C
19 RX-3740C
20 RX-3741C
21 RX-3742C
22 RX-3743C
23 RX-3744C
24 RX-3745C
25 RX-3746C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3747C
2 RX-3748C
3 RX-3749C
4 RX-3750C
5 RX-3751C
6 RX-3752C
7 RX-3753C
8 RX-3754C
9 RX-3755C
10 RX-3756C
11 RX-3757C
12 RX-3758C
13 RX-3759C
14 RX-3760C
15 RX-3761C
16 RX-3762C
17 RX-3763C
18 RX-3764C
19 RX-3765C
20 RX-3766C
21 RX-3767C
22 RX-3768C
23 RX-3769C
24 RX-3770C
25 RX-3771C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3772C
2 RX-3773C
3 RX-3774C
4 RX-3775C
5 RX-3776C
6 RX-3777C
7 RX-3778C
8 RX-3779C
9 RX-3780C
10 RX-3781C
11 RX-3782C
12 RX-3783C
13 RX-3784C
14 RX-3785C
15 RX-3786C
16 RX-3787C
17 RX-3788C
18 RX-3789C
19 RX-3790C
20 RX-3791C
21 RX-3792C
22 RX-3793C
23 RX-3794C
24 RX-3795C
25 RX-3796C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3797C
2 RX-3798C
3 RX-3799C
4 RX-3800C
5 RX-3801C
6 RX-3802C
7 RX-3803C
8 RX-3804C
9 RX-3805C
10 RX-3806C
11 RX-3807C
12 RX-3808C
13 RX-3809C
14 RX-3810C
15 RX-3811C
16 RX-3812C
17 RX-3813C
18 RX-3814C
19 RX-3815C
20 RX-3816C
21 RX-3817C
22 RX-3818C
23 RX-3819C
24 RX-3820C
25 RX-3821C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3822C
2 RX-3823C
3 RX-3824C
4 RX-3825C
5 RX-3826C
6 RX-3827C
7 RX-3828C
8 RX-3829C
9 RX-3830C
10 RX-3831C
11 RX-3832C
12 RX-3833C
13 RX-3834C
14 RX-3835C
15 RX-3836C
16 RX-3837C
17 RX-3838C
18 RX-3839C
19 RX-3840C
20 RX-3841C
21 RX-3842C
22 RX-3843C
23 RX-3844C
24 RX-3845C
25 RX-3846C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3847C
2 RX-3848C
3 RX-3849C
4 RX-3850C
5 RX-3851C
6 RX-3852C
7 RX-3853C
8 RX-3854C
9 RX-3855C
10 RX-3856C
11 RX-3857C
12 RX-3858C
13 RX-3859C
14 RX-3860C
15 RX-3861C
16 RX-3862C
17 RX-3863C
18 RX-3864C
19 RX-3865C
20 RX-3866C
21 RX-3867C
22 RX-3868C
23 RX-3869C
24 RX-3870C
25 RX-3871C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3872C
2 RX-3873C
3 RX-3874C
4 RX-3875C
5 RX-3876C
6 RX-3877C
7 RX-3878C
8 RX-3879C
9 RX-3880C
10 RX-3881C
11 RX-3882C
12 RX-3883C
13 RX-3884C
14 RX-3885C
15 RX-3886C
16 RX-3887C
17 RX-3888C
18 RX-3889C
19 RX-3890C
20 RX-3899C
21 RX-3900C
22 RX-3901C
23 RX-3902C
24 RX-3903C
25 RX-3904C

Heritage Reporting Corporation
(202) 628-4888

1 RX-3906C
2 RX-3907C
3 RX-3908
4 RX-3909
5 RX-3910
6 RX-3911
7 RX-3913
8 RX-3914
9 RX-3915
10 RX-3916
11 RX-3918
12 RX-3919
13 RX-3920
14 RX-3921
15 RX-3922
16 RX-3923
17 RX-3924
18 RX-3925
19 RX-3926
20 RX-3927
21 RX-3928
22 RX-3929
23 RX-3930
24 RX-3932
25 RX-3933

Heritage Reporting Corporation
(202) 628-4888

1 RX-3934
2 RX-3935
3 RX-3936
4 RX-3937
5 RX-3938
6 RX-3939
7 RX-3940
8 RX-3941
9 RX-3942
10 RX-3943
11 RX-3944
12 RX-3945
13 RX-3946
14 RX-3947
15 RX-3948
16 RX-3949
17 RX-3950
18 RX-3952
19 RX-3953
20 RX-3954
21 RX-3955
22 RX-3956
23 RX-3957
24 RX-3958
25 RX-3959

Heritage Reporting Corporation
(202) 628-4888

1 RX-3960
2 RX-3961
3 RX-3962
4 RX-3963
5 RX-3964
6 RX-3965
7 RX-3966
8 RX-3969
9 RX-3971
10 RX-3972
11 RX-3973
12 RX-3974
13 RX-3975
14 RX-3976
15 RX-3977
16 RX-3978
17 RX-3979
18 RX-3980
19 RX-3981
20 RX-3982
21 RX-3983
22 RX-3984
23 RX-3985
24 RX-3986
25 RX-3988

Heritage Reporting Corporation
(202) 628-4888

1 RX-3989
2 RX-3990
3 RX-3991
4 RX-3992
5 RX-3993
6 RX-3994
7 RX-3995
8 RX-3996
9 RX-3997
10 RX-3998
11 RX-3999
12 RX-4000
13 RX-4001
14 RX-4002
15 RX-4003
16 RX-4004
17 RX-4005
18 RX-4006
19 RX-4007
20 RX-4008
21 RX-4009
22 RX-4010
23 RX-4011
24 RX-4012
25 RX-4013

Heritage Reporting Corporation
(202) 628-4888

1 RX-4014
2 RX-4015
3 RX-4016
4 RX-4017
5 RX-4018
6 RX-4019
7 RX-4020
8 RX-4021
9 RX-4022
10 RX-4023
11 RX-4024
12 RX-4025
13 RX-4026
14 RX-4027
15 RX-4028
16 RX-4029
17 RX-4030
18 RX-4031
19 RX-4032
20 RX-4033
21 RX-4034
22 RX-4035
23 RX-4036
24 RX-4037
25 RX-4038

Heritage Reporting Corporation
(202) 628-4888

1 RX-4039
2 RX-4040
3 RX-4041
4 RX-4042
5 RX-4043
6 RX-4044
7 RX-4045
8 RX-4046
9 RX-4047
10 RX-4048
11 RX-4049
12 RX-4050
13 RX-4051
14 RX-4054
15 RX-4055C
16 RX-4056C
17 RX-4057C
18 RX-4058C
19 RX-4059C
20 RX-4060C
21 RX-4061C
22 RX-4062C
23 RX-4063C
24 RX-4064
25 RX-4065

Heritage Reporting Corporation
(202) 628-4888

1 RX-4066
2 RX-4067
3 RX-4068
4 RX-4069
5 RX-4070
6 RX-4071
7 RX-4072
8 RX-4073
9 RX-4075
10 RX-4076
11 RX-4077
12 RX-4078
13 RX-4079
14 RX-4080
15 RX-4081
16 RX-4082
17 RX-4083
18 RX-4084
19 RX-4085
20 RX-4086
21 RX-4087
22 RX-4088
23 RX-4089
24 RX-4090
25 RX-4091

Heritage Reporting Corporation
(202) 628-4888

1 RX-4092
2 RX-4093
3 RX-4094
4 RX-4095
5 RX-4096
6 RX-4097
7 RX-4098
8 RX-4099
9 RX-4100
10 RX-4101
11 RX-4102
12 RX-4103
13 RX-4104
14 RX-4105
15 RX-4106
16 RX-4107
17 RX-4108
18 RX-4109
19 RX-4110
20 RX-4111
21 RX-4112
22 RX-4113
23 RX-4114
24 RX-4115
25 RX-4116

Heritage Reporting Corporation
(202) 628-4888

1 RX-4117
2 RX-4118
3 RX-4119
4 RX-4120
5 RX-4121
6 RX-4122
7 RX-4123
8 RX-4124
9 RX-4125
10 RX-4126
11 RX-4127
12 RX-4128
13 RX-4129
14 RX-4130
15 RX-4131
16 RX-4133
17 RX-4134
18 RX-4135
19 RX-4136
20 RX-4137
21 RX-4138
22 RX-4139
23 RX-4140
24 RX-4141
25 RX-4142C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4143C
2 RX-4144C
3 RX-4145C
4 RX-4146C
5 RX-4147C
6 RX-4148C
7 RX-4149C
8 RX-4150C
9 RX-4151C
10 RX-4152C
11 RX-4153C
12 RX-4154C
13 RX-4155C
14 RX-4156C
15 RX-4157C
16 RX-4158C
17 RX-4159C
18 RX-4160C
19 RX-4161C
20 RX-4162C
21 RX-4163C
22 RX-4164C
23 RX-4165C
24 RX-4166C
25 RX-4167C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4168C
2 RX-4169C
3 RX-4170C
4 RX-4171C
5 RX-4172C
6 RX-4173C
7 RX-4174C
8 RX-4175C
9 RX-4176C
10 RX-4177C
11 RX-4178C
12 RX-4179C
13 RX-4180C
14 RX-4181C
15 RX-4182C
16 RX-4184C
17 RX-4185C
18 RX-4186C
19 RX-4187C
20 RX-4188C
21 RX-4189C
22 RX-4190C
23 RX-4191C
24 RX-4192C
25 RX-4193C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4194C
2 RX-4195C
3 RX-4196C
4 RX-4197C
5 RX-4198C
6 RX-4199C
7 RX-4200C
8 RX-4201C
9 RX-4202C
10 RX-4203C
11 RX-4204C
12 RX-4205C
13 RX-4206C
14 RX-4207C
15 RX-4208C
16 RX-4209C
17 RX-4210C
18 RX-4211C
19 RX-4212C
20 RX-4213C
21 RX-4214C
22 RX-4215C
23 RX-4216C
24 RX-4217C
25 RX-4218C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4219C
2 RX-4220C
3 RX-4221C
4 RX-4222C
5 RX-4223C
6 RX-4224C
7 RX-4225C
8 RX-4226C
9 RX-4227C
10 RX-4228C
11 RX-4229C
12 RX-4230C
13 RX-4231C
14 RX-4232C
15 RX-4233C
16 RX-4234C
17 RX-4235C
18 RX-4236C
19 RX-4237C
20 RX-4238C
21 RX-4239C
22 RX-4240C
23 RX-4241C
24 RX-4242C
25 RX-4243C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4244C
2 RX-4245C
3 RX-4246C
4 RX-4247C
5 RX-4248C
6 RX-4249C
7 RX-4250C
8 RX-4251C
9 RX-4252C
10 RX-4253C
11 RX-4254C
12 RX-4255C
13 RX-4256C
14 RX-4257C
15 RX-4258C
16 RX-4259C
17 RX-4260C
18 RX-4261C
19 RX-4262C
20 RX-4263C
21 RX-4264C
22 RX-4265C
23 RX-4266C
24 RX-4267C
25 RX-4268C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4269C
2 RX-4270C
3 RX-4271C
4 RX-4272C
5 RX-4273
6 RX-4274
7 RX-4275
8 RX-4276
9 RX-4277
10 RX-4278
11 RX-4279
12 RX-4280
13 RX-4281
14 RX-4282
15 RX-4283
16 RX-4284
17 RX-4285
18 RX-4286
19 RX-4287
20 RX-4288
21 RX-4289
22 RX-4290
23 RX-4291
24 RX-4292
25 RX-4293

Heritage Reporting Corporation
(202) 628-4888

1 RX-4294
2 RX-4295
3 RX-4296
4 RX-4297
5 RX-4298
6 RX-4299
7 RX-4300
8 RX-4301
9 RX-4302
10 RX-4303
11 RX-4304
12 RX-4305
13 RX-4306
14 RX-4307
15 RX-4308
16 RX-4309
17 RX-4310
18 RX-4311
19 RX-4312
20 RX-4313
21 RX-4314
22 RX-4315
23 RX-4316
24 RX-4317
25 RX-4318

Heritage Reporting Corporation
(202) 628-4888

1 RX-4319
2 RX-4320
3 RX-4321
4 RX-4322
5 RX-4323
6 RX-4324
7 RX-4325
8 RX-4326
9 RX-4327
10 RX-4328
11 RX-4329
12 RX-4330
13 RX-4331
14 RX-4332C
15 RX-4333C
16 RX-4334C
17 RX-4335C
18 RX-4336C
19 RX-4337C
20 RX-4338C
21 RX-4339C
22 RX-4340C
23 RX-4341C
24 RX-4342C
25 RX-4343C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4344C
2 RX-4345C
3 RX-4346C
4 RX-4347C
5 RX-4348C
6 RX-4349C
7 RX-4350C
8 RX-4351C
9 RX-4352C
10 RX-4353C
11 RX-4354C
12 RX-4355C
13 RX-4356C
14 RX-4357C
15 RX-4358C
16 RX-4359C
17 RX-4360C
18 RX-4361C
19 RX-4362C
20 RX-4363C
21 RX-4364C
22 RX-4365C
23 RX-4366C
24 RX-4367C
25 RX-4368C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4369C
2 RX-4370C
3 RX-4371C
4 RX-4372C
5 RX-4373C
6 RX-4374C
7 RX-4375C
8 RX-4376C
9 RX-4377C
10 RX-4378C
11 RX-4379C
12 RX-4380C
13 RX-4381C
14 RX-4382C
15 RX-4383C
16 RX-4384C
17 RX-4385C
18 RX-4386C
19 RX-4387C
20 RX-4388C
21 RX-4389C
22 RX-4390C
23 RX-4391C
24 RX-4392C
25 RX-4393C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4394C
2 RX-4395C
3 RX-4396C
4 RX-4397C
5 RX-4398C
6 RX-4399C
7 RX-4400C
8 RX-4401C
9 RX-4402C
10 RX-4403C
11 RX-4404C
12 RX-4405C
13 RX-4406C
14 RX-4407C
15 RX-4408C
16 RX-4409C
17 RX-4410C
18 RX-4411C
19 RX-4412C
20 RX-4413C
21 RX-4414C
22 RX-4415C
23 RX-4416C
24 RX-4417C
25 RX-4418C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4419C
2 RX-4420C
3 RX-4421C
4 RX-4422C
5 RX-4423C
6 RX-4424C
7 RX-4425C
8 RX-4426C
9 RX-4427C
10 RX-4428C
11 RX-4429C
12 RX-4430C
13 RX-4431C
14 RX-4432C
15 RX-4433C
16 RX-4434C
17 RX-4435C
18 RX-4436C
19 RX-4437C
20 RX-4438C
21 RX-4442C
22 RX-4443C
23 RX-4444C
24 RX-4445C
25 RX-4448C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4450C
2 RX-4451
3 RX-4452
4 RX-4453
5 RX-4454
6 RX-4455
7 RX-4456
8 RX-4457
9 RX-4458
10 RX-4459
11 RX-4460
12 RX-4461
13 RX-4463
14 RX-4464
15 RX-4467
16 RX-4470
17 RX-4471
18 RX-4473
19 RX-4478
20 RX-4483
21 RX-4484C
22 RX-4485C
23 RX-4486C
24 RX-4487C
25 RX-4488C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4489C
2 RX-4490C
3 RX-4491C
4 RX-4492C
5 RX-4493C
6 RX-4494C
7 RX-4495C
8 RX-4496C
9 RX-4497C
10 RX-4498C
11 RX-4499C
12 RX-4500C
13 RX-4501C
14 RX-4502C
15 RX-4503C
16 RX-4504C
17 RX-4505C
18 RX-4506C
19 RX-4507C
20 RX-4508C
21 RX-4509C
22 RX-4510C
23 RX-4511C
24 RX-4512C
25 RX-4513C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4514C
2 RX-4515C
3 RX-4516C
4 RX-4517C
5 RX-4518C
6 RX-4519C
7 RX-4520C
8 RX-4521C
9 RX-4522C
10 RX-4523C
11 RX-4524C
12 RX-4525C
13 RX-4526C
14 RX-4527C
15 RX-4528C
16 RX-4529C
17 RX-4530C
18 RX-4531C
19 RX-4532C
20 RX-4533C
21 RX-4534C
22 RX-4535C
23 RX-4536C
24 RX-4537C
25 RX-4538C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4539C
2 RX-4540C
3 RX-4541C
4 RX-4542C
5 RX-4543C
6 RX-4544C
7 RX-4545C
8 RX-4546C
9 RX-4547C
10 RX-4548C
11 RX-4549C
12 RX-4550C
13 RX-4551C
14 RX-4552
15 RX-4553C
16 RX-4554
17 RX-4555C
18 RX-4556
19 RX-4557
20 RX-4558
21 RX-4559C
22 RX-4560C
23 RX-4561C
24 RX-4562C
25 RX-4563C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4564C
2 RX-4565C
3 RX-4566C
4 RX-4567C
5 RX-4568C
6 RX-4569C
7 RX-4570C
8 RX-4571C
9 RX-4572C
10 RX-4573C
11 RX-4574C
12 RX-4575C
13 RX-4576C
14 RX-4577
15 RX-4578
16 RX-4579
17 RX-4580
18 RX-4581
19 RX-4582
20 RX-4583
21 RX-4584
22 RX-4585
23 RX-4586
24 RX-4587
25 RX-4588

Heritage Reporting Corporation
(202) 628-4888

1 RX-4589
2 RX-4591
3 RX-4593
4 RX-4594
5 RX-4595
6 RX-4596
7 RX-4597
8 RX-4598
9 RX-4599
10 RX-4600
11 RX-4601
12 RX-4603
13 RX-4604
14 RX-4605
15 RX-4606
16 RX-4607
17 RX-4608
18 RX-4609
19 RX-4610
20 RX-4611
21 RX-4613
22 RX-4614
23 RX-4616
24 RX-4617
25 RX-4618

Heritage Reporting Corporation
(202) 628-4888

1 RX-4619
2 RX-4620
3 RX-4621
4 RX-4622
5 RX-4623
6 RX-4624
7 RX-4625
8 RX-4626
9 RX-4627
10 RX-4628
11 RX-4629
12 RX-4630
13 RX-4631
14 RX-4632
15 RX-4633
16 RX-4634
17 RX-4635
18 RX-4636
19 RX-4637
20 RX-4638
21 RX-4639
22 RX-4640
23 RX-4641
24 RX-4642
25 RX-4643

Heritage Reporting Corporation
(202) 628-4888

1 RX-4644
2 RX-4645
3 RX-4646
4 RX-4647
5 RX-4648
6 RX-4649
7 RX-4650
8 RX-4651
9 RX-4652
10 RX-4653
11 RX-4654
12 RX-4663
13 RX-4664
14 RX-4670
15 RX-4677
16 RX-4678
17 RX-4679
18 RX-4680
19 RX-4682
20 RX-4683
21 RX-4685
22 RX-4686
23 RX-4687
24 RX-4689
25 RX-4690

Heritage Reporting Corporation
(202) 628-4888

1 RX-4692
2 RX-4693
3 RX-4694
4 RX-4696
5 RX-4697
6 RX-4699
7 RX-4706
8 RX-4707
9 RX-4708
10 RX-4710
11 RX-4711
12 RX-4712
13 RX-4713
14 RX-4714
15 RX-4715
16 RX-4716
17 RX-4717
18 RX-4719
19 RX-4720
20 RX-4722
21 RX-4723
22 RX-4724
23 RX-4725
24 RX-4726
25 RX-4727

Heritage Reporting Corporation
(202) 628-4888

1 RX-4728
2 RX-4729
3 RX-4730
4 RX-4731
5 RX-4732
6 RX-4733
7 RX-4734
8 RX-4735
9 RX-4736
10 RX-4737
11 RX-4738
12 RX-4739
13 RX-4740
14 RX-4741
15 RX-4742
16 RX-4743
17 RX-4744
18 RX-4745
19 RX-4746
20 RX-4748C
21 RX-4750C
22 RX-4751C
23 RX-4752C
24 RX-4753C
25 RX-4754C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4755C
2 RX-4757C
3 RX-4758C
4 RX-4759C
5 RX-4761C
6 RX-4762C
7 RX-4763C
8 RX-4764C
9 RX-4765C
10 RX-4766C
11 RX-4767C
12 RX-4768C
13 RX-4769C
14 RX-4770C
15 RX-4771C
16 RX-4772C
17 RX-4773C
18 RX-4774C
19 RX-4775C
20 RX-4776C
21 RX-4777C
22 RX-4778C
23 RX-4804C
24 RX-4805C
25 RX-4806C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4807C
2 RX-4808
3 RX-4809
4 RX-4810
5 RX-4811
6 RX-4812
7 RX-4813
8 RX-4814
9 RX-4815
10 RX-4816C
11 RX-4817C
12 RX-4818C
13 RX-4819C
14 RX-4820C
15 RX-4821C
16 RX-4822C
17 RX-4823C
18 RX-4824C
19 RX-4825C
20 RX-4826C
21 RX-4827C
22 RX-4828C
23 RX-4829C
24 RX-4830C
25 RX-4831C

Heritage Reporting Corporation
(202) 628-4888

1 RX-4832C
2 RX-4833C
3 RX-4834C
4 RX-4835
5 RX-4836
6 RX-4837
7 RX-4838
8 RX-4839
9 RX-4840
10 RX-4842
11 RX-4843
12 RX-4844
13 RX-4847
14 RX-4851
15 RX-4852
16 RX-4853
17 RX-4855
18 RX-4856
19 RX-4857
20 RX-4858
21 RX-4871
22 RX-4872
23 RX-4873
24 RX-4876
25 RX-4877

Heritage Reporting Corporation
(202) 628-4888

1 RX-4882
2 RX-4884
3 RX-4889
4 RX-4891
5 RX-4892
6 RX-4893
7 RX-4894
8 RX-4895
9 RX-4896
10 RX-4897
11 RX-4898
12 RX-4899
13 RX-4900
14 RX-4901
15 RX-4902
16 RX-4903
17 RX-4904
18 RX-4905
19 RX-4906
20 RX-4907
21 RX-4908
22 RX-4909
23 RX-4910
24 RX-4911
25 RX-4912

Heritage Reporting Corporation
(202) 628-4888

1 RX-4913
2 RX-4914
3 RX-4915
4 RX-4916
5 RX-4917
6 RX-4918
7 RX-4919
8 RX-4920
9 RX-4921
10 RX-4922
11 RX-4923
12 RX-4924
13 RX-4925
14 RX-4926
15 RX-4927
16 RX-4928
17 RX-4929
18 RX-4930
19 RX-4931
20 RX-4932
21 RX-4933
22 RX-4935
23 RX-4936
24 RX-4938
25 RX-4939

Heritage Reporting Corporation
(202) 628-4888

1 RX-4940
2 RX-4941
3 RX-4942
4 RX-4943
5 RX-4944
6 RX-4945
7 RX-4946
8 RX-4947
9 RX-4971
10 RX-4977
11 RX-4978
12 RX-4979
13 RX-4980
14 RX-4981
15 RX-4982
16 RX-4983
17 RX-4984
18 RX-4985
19 RX-4986
20 RX-4987
21 RX-4988
22 RX-4989
23 RX-4990
24 RX-4991
25 RX-4993

Heritage Reporting Corporation
(202) 628-4888

1 RX-4997
2 RX-5032
3 RX-5033C
4 RX-5034
5 RX-5035
6 RX-5036
7 RX-5037
8 RX-5038
9 RX-5039
10 RX-5040
11 RX-5042
12 RX-5043
13 RX-5044
14 RX-5045
15 RX-5046
16 RX-5047
17 RX-5048
18 RX-5050
19 RX-5051
20 RX-5052
21 RX-5053
22 RX-5054
23 RX-5055
24 RX-5056
25 RX-5057

Heritage Reporting Corporation
(202) 628-4888

1 RX-5058
2 RX-5059
3 RX-5060
4 RX-5061
5 RX-5062
6 RX-5064
7 RX-5065
8 RX-5146
9 RX-5147
10 RX-5148
11 RX-5149
12 RX-5150
13 RX-5151C
14 RX-5152C
15 RX-5153C
16 RX-5154C
17 RX-5155C
18 RX-5156C
19 RX-5157C
20 RX-5158C
21 RX-5159C
22 RX-5160C
23 RX-5161C
24 RX-5162
25 RX-5163

Heritage Reporting Corporation
(202) 628-4888

1 RX-5164
2 RX-5165C
3 RX-5183C
4 RX-5185C
5 RX-5186C
6 RX-5187C
7 RX-5188
8 RX-5189
9 RX-5191
10 RX-5192
11 RX-5193
12 RX-5196
13 RX-5197
14 RX-5200
15 RX-5201
16 RX-5202
17 RX-5203
18 RX-5204
19 RX-5205
20 RX-5206
21 RX-5207
22 RX-5208
23 RX-5209
24 RX-5210
25 RX-5211

Heritage Reporting Corporation
(202) 628-4888

1 RX-5212
2 RX-5213
3 RX-5214
4 RX-5215
5 RX-5216
6 RX-5217
7 RX-5218
8 RX-5219
9 RX-5220
10 RX-5221
11 RX-5222
12 RX-5223
13 RX-5224
14 RX-5235
15 RX-5237
16 RX-5238
17 RX-5239
18 RX-5240
19 RX-5243
20 RX-5244
21 RX-5245
22 RX-5246
23 RX-5249
24 RX-5250
25 RX-5251

Heritage Reporting Corporation
(202) 628-4888

1 RX-5252
2 RX-5253
3 RX-5254
4 RX-5255
5 RX-5256
6 RX-5257
7 RX-5258
8 RX-5260
9 RX-5262
10 RX-5263
11 RX-5281
12 RX-5282
13 RX-5283
14 RX-5284
15 RX-5285
16 RX-5287
17 RX-5318C
18 RX-5319C
19 RX-5320C
20 RX-5339
21 RX-5340
22 RX-5341
23 RX-5342
24 RX-5343
25 RX-5344

Heritage Reporting Corporation
(202) 628-4888

1 RX-5345CBI
2 RX-5346CBI
3 RX-5347
4 RX-5348
5 RX-5349
6 RX-5350
7 RX-5351
8 RX-5352
9 RX-5353
10 RX-5354
11 RX-5355CBI
12 RX-5356
13 RX-5357
14 RX-5358
15 RX-5359
16 RX-5360
17 RX-5361
18 RX-5362
19 RX-5363
20 RX-5364
21 RX-5365
22 RX-5366
23 RX-5367
24 RX-5368
25 RX-5369

Heritage Reporting Corporation
(202) 628-4888

1 RX-5370
2 RX-5371
3 RX-5372
4 RX-5373
5 RX-5374
6 RX-5375CBI
7 RX-5376CBI
8 RX-5377CBI
9 RX-5378CBI
10 RX-5379CBI
11 RX-5380CBI
12 RX-5381CBI
13 RX-5382CBI
14 RX-5383CBI
15 RX-5384CBI
16 RX-5385CBI
17 RX-5386CBI
18 RX-5387CBI
19 RX-5388CBI
20 RX-5389CBI
21 RX-5390CBI
22 RX-5391CBI
23 RX-5392CBI
24 RX-5393CBI
25 RX-5394CBI

Heritage Reporting Corporation
(202) 628-4888

1 RX-5395CBI
2 RX-5396CBI
3 RX-5397CBI
4 RX-5398CBI
5 RX-5399
6 RX-5400
7 RX-5401
8 RX-5402
9 RX-5403
10 RX-5404
11 RX-5405
12 RX-5406
13 RX-5407
14 RX-5408
15 RX-5409
16 RX-5410
17 RX-5411
18 RX-5412
19 RX-5413
20 RX-5414
21 RX-5415
22 RX-5416
23 RX-5417
24 RX-5418
25 RX-5419

Heritage Reporting Corporation
(202) 628-4888

1 RX-5420
2 RX-5421
3 RX-5422
4 RX-5423
5 RX-5424
6 RX-5425
7 RX-5426
8 RX-5427
9 RX-5428
10 RX-5429
11 RX-5430
12 RX-5431
13 RX-5432
14 RX-5433
15 RX-5434
16 RX-5435
17 RX-5436
18 RX-5437
19 RX-5438
20 RX-5439
21 RX-5440
22 RX-5441
23 RX-5442
24 RX-5443
25 RX-5444

Heritage Reporting Corporation
(202) 628-4888

1 RX-5445
2 RX-5446
3 RX-5447
4 RX-5448
5 RX-5449
6 RX-5450
7 RX-5451
8 RX-5452
9 RX-5453
10 RX-5454
11 RX-5455
12 RX-5456
13 RX-5457
14 RX-5458
15 RX-5459
16 RX-5460
17 RX-5461
18 RX-5462
19 RX-5463
20 RX-5464
21 RX-5465
22 RX-5466
23 RX-5467
24 RX-5468
25 RX-5469

Heritage Reporting Corporation
(202) 628-4888

1 RX-5470
2 RX-5471
3 RX-5472
4 RX-5473
5 RX-5474
6 RX-5475
7 RX-5476
8 RX-5477
9 RX-5478
10 RX-5479
11 RX-5480
12 RX-5481
13 RX-5482
14 RX-5483
15 RX-5484
16 RX-5485
17 RX-5486
18 RX-5487
19 RX-5488
20 RX-5489
21 RX-5490
22 RX-5491
23 RX-5492CBI
24 RX-5493CBI
25 RX-5495CBI

Heritage Reporting Corporation
(202) 628-4888

1 RX-5496CBI
2 RX-5497
3 RX-5498C
4 RX-5501
5 RX-5502
6 RX-5503
7 RX-5504
8 RX-5505
9 RX-5506
10 RX-5507
11 RPX-0001
12 RPX-0002
13 RPX-0003
14 RPX-0004
15 RPX-0009C
16 RPX-0010C
17 RPX-0011C
18 RPX-0012C
19 RPX-0013C
20 RPX-0015C
21 RPX-0022C
22 RPX-0023C
23 RPX-0024C
24 RPX-0025C
25 RPX-0026C

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0027C
2 RPX-0028C
3 RPX-0029C
4 RPX-0030C
5 RPX-0031C
6 RPX-0050C
7 RPX-0051C
8 RPX-0053C
9 RPX-0054C
10 RPX-0056C
11 RPX-0057C
12 RPX-0058C
13 RPX-0060C
14 RPX-0061C
15 RPX-0063C
16 RPX-0064C
17 RPX-0065C
18 RPX-0066C
19 RPX-0067C
20 RPX-0068C
21 RPX-0069C
22 RPX-0070C
23 RPX-0071C
24 RPX-0072C
25 RPX-0073C

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0074C
2 RPX-0075C
3 RPX-0076C
4 RPX-0077C
5 RPX-0078C
6 RPX-0079C
7 RPX-0080C
8 RPX-0081C
9 RPX-0082C
10 RPX-0085
11 RPX-0086
12 RPX-0087
13 RPX-0088
14 RPX-0089
15 RPX-0090
16 RPX-0091
17 RPX-0092
18 RPX-0093
19 RPX-0094
20 RPX-0095
21 RPX-0096
22 RPX-0097
23 RPX-0098
24 RPX-0099
25 RPX-0100

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0101
2 RPX-0102
3 RPX-0103
4 RPX-0104
5 RPX-0105
6 RPX-0106
7 RPX-0107
8 RPX-0108
9 RPX-0109
10 RPX-0110
11 RPX-0111
12 RPX-0112
13 RPX-0113
14 RPX-0114
15 RPX-0115
16 RPX-0116
17 RPX-0117
18 RPX-0118
19 RPX-0119
20 RPX-0120
21 RPX-0121
22 RPX-0122
23 RPX-0123
24 RPX-0124
25 RPX-0125

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0126
2 RPX-0127
3 RPX-0128
4 RPX-0129
5 RPX-0130
6 RPX-0131
7 RPX-0132
8 RPX-0133
9 RPX-0134
10 RPX-0135
11 RPX-0136
12 RPX-0137
13 RPX-0138
14 RPX-0139
15 RPX-0140
16 RPX-0141
17 RPX-0142
18 RPX-0143
19 RPX-0144
20 RPX-0145
21 RPX-0146
22 RPX-0147
23 RPX-0148
24 RPX-0149
25 RPX-0150

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0151
2 RPX-0152
3 RPX-0153
4 RPX-0154
5 RPX-0155
6 RPX-0156
7 RPX-0157
8 RPX-0158
9 RPX-0159
10 RPX-0160
11 RPX-0161
12 RPX-0162
13 RPX-0163
14 RPX-0164
15 RPX-0165
16 RPX-0166
17 RPX-0167
18 RPX-0168
19 RPX-0169
20 RPX-0170
21 RPX-0171
22 RPX-0172
23 RPX-0173
24 RPX-0174
25 RPX-0175

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0176
2 RPX-0177
3 RPX-0178
4 RPX-0179
5 RPX-0180
6 RPX-0181
7 RPX-0182
8 RPX-0183
9 RPX-0184
10 RPX-0185
11 RPX-0186
12 RPX-0187
13 RPX-0188
14 RPX-0189
15 RPX-0190
16 RPX-0191
17 RPX-0192
18 RPX-0193
19 RPX-0194
20 RPX-0195
21 RPX-0196
22 RPX-0197
23 RPX-0198
24 RPX-0199
25 RPX-0200

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0201
2 RPX-0202
3 RPX-0203
4 RPX-0204
5 RPX-0205
6 RPX-0206C
7 RPX-0207C
8 RPX-0208C
9 RPX-0209C
10 RPX-0210C
11 RPX-0211C
12 RPX-0212C
13 RPX-0213C
14 RPX-0214C
15 RPX-0215C
16 RPX-0216C
17 RPX-0217C
18 RPX-0218C
19 RPX-0219C
20 RPX-0220C
21 RPX-0221C
22 RPX-0222C
23 RPX-0223C
24 RPX-0224C
25 RPX-0225C

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0226C
2 RPX-0227C
3 RPX-0228C
4 RPX-0229C
5 RPX-0230C
6 RPX-0231C
7 RPX-0232C
8 RPX-0233C
9 RPX-0234
10 RPX-0235
11 RPX-0236
12 RPX-0237
13 RPX-0238
14 RPX-0239
15 RPX-0240C
16 RPX-0241C
17 RPX-0242C
18 RPX-0243C
19 RPX-0244C
20 RPX-0245C
21 RPX-0246C
22 RPX-0247C
23 RPX-0248
24 RPX-0249
25 RPX-0250

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0251
2 RPX-0252
3 RPX-0253
4 RPX-0254
5 RPX-0255
6 RPX-0256
7 RPX-0257
8 RPX-0258
9 RPX-0259
10 RPX-0260
11 RPX-0261
12 RPX-0262
13 RPX-0263
14 RPX-0264
15 RPX-0265
16 RPX-0266
17 RPX-0267
18 RPX-0268
19 RPX-0269
20 RPX-0270
21 RPX-0271
22 RPX-0272
23 RPX-0273
24 RPX-0274
25 RPX-0275

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0276
2 RPX-0277
3 RPX-0278
4 RPX-0279
5 RPX-0280
6 RPX-0281
7 RPX-0282
8 RPX-0283
9 RPX-0284
10 RPX-0285
11 RPX-0286
12 RPX-0287
13 RPX-0288
14 RPX-0289
15 RPX-0290
16 RPX-0291
17 RPX-0292
18 RPX-0293
19 RPX-0294
20 RPX-0295
21 RPX-0296
22 RPX-0297
23 RPX-0298
24 RPX-0299
25 RPX-0300

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0301
2 RPX-0302
3 RPX-0303
4 RPX-0304
5 RPX-0305
6 RPX-0306
7 RPX-0307
8 RPX-0308
9 RPX-0309
10 RPX-0310
11 RPX-0311
12 RPX-0312
13 RPX-0313
14 RPX-0314
15 RPX-0315
16 RPX-0316
17 RPX-0317
18 RPX-0318
19 RPX-0319
20 RPX-0320
21 RPX-0321
22 RPX-0322
23 RPX-0323
24 RPX-0324
25 RPX-0325

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0326
2 RPX-0327
3 RPX-0328
4 RPX-0329
5 RPX-0330
6 RPX-0331
7 RPX-0332
8 RPX-0333
9 RPX-0334
10 RPX-0335
11 RPX-0336
12 RPX-0337
13 RPX-0338
14 RPX-0339
15 RPX-0340
16 RPX-0341
17 RPX-0342
18 RPX-0343
19 RPX-0344
20 RPX-0345
21 RPX-0346
22 RPX-0347
23 RPX-0348
24 RPX-0349
25 RPX-0350

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0351
2 RPX-0352
3 RPX-0353
4 RPX-0354
5 RPX-0355
6 RPX-0356
7 RPX-0357
8 RPX-0358
9 RPX-0359
10 RPX-0360
11 RPX-0361
12 RPX-0362
13 RPX-0363
14 RPX-0364
15 RPX-0365
16 RPX-0366
17 RPX-0367
18 RPX-0368
19 RPX-0369
20 RPX-0370
21 RPX-0371
22 RPX-0372
23 RPX-0373
24 RPX-0374
25 RPX-0375

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0376
2 RPX-0377
3 RPX-0378
4 RPX-0379
5 RPX-0380
6 RPX-0381
7 RPX-0382
8 RPX-0383
9 RPX-0384
10 RPX-0385
11 RPX-0386
12 RPX-0387
13 RPX-0388
14 RPX-0389
15 RPX-0390
16 RPX-0391
17 RPX-0392
18 RPX-0393
19 RPX-0394
20 RPX-0395
21 RPX-0396
22 RPX-0397
23 RPX-0398
24 RPX-0399
25 RPX-0400

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0401
2 RPX-0402
3 RPX-0403
4 RPX-0404
5 RPX-0405
6 RPX-0406
7 RPX-0407
8 RPX-0408
9 RPX-0409
10 RPX-0410
11 RPX-0411
12 RPX-0412
13 RPX-0413
14 RPX-0414
15 RPX-0415
16 RPX-0416
17 RPX-0417
18 RPX-0418
19 RPX-0419
20 RPX-0420
21 RPX-0421
22 RPX-0422
23 RPX-0423
24 RPX-0424
25 RPX-0425

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0426
2 RPX-0427
3 RPX-0428
4 RPX-0429
5 RPX-0430
6 RPX-0431
7 RPX-0432
8 RPX-0433
9 RPX-0434
10 RPX-0435
11 RPX-0436
12 RPX-0437
13 RPX-0438
14 RPX-0439
15 RPX-0440
16 RPX-0441
17 RPX-0442
18 RPX-0443
19 RPX-0444
20 RPX-0445
21 RPX-0446
22 RPX-0447
23 RPX-0448C
24 RPX-0449C
25 RPX-0450C

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0451C
2 RPX-0452C
3 RPX-0453C
4 RPX-0454C
5 RPX-0455C
6 RPX-0456C
7 RPX-0457C
8 RPX-0458C
9 RPX-0459C
10 RPX-0460C
11 RPX-0461C
12 RPX-0462C
13 RPX-0463C
14 RPX-0464C
15 RPX-0465C
16 RPX-0466C
17 RPX-0467C
18 RPX-0468C
19 RPX-0469C
20 RPX-0470C
21 RPX-0471C
22 RPX-0472C
23 RPX-0473C
24 RPX-0474C
25 RPX-0475C

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0476C
2 RPX-0477C
3 RPX-0478C
4 RPX-0479C
5 RPX-0480C
6 RPX-0481C
7 RPX-0482C
8 RPX-0483C
9 RPX-0484C
10 RPX-0485C
11 RPX-0486C
12 RPX-0487C
13 RPX-0488C
14 RPX-0489C
15 RPX-0490C
16 RPX-0491C
17 RPX-0492C
18 RPX-0493C
19 RPX-0494C
20 RPX-0495C
21 RPX-0496C
22 RPX-0497C
23 RPX-0498C
24 RPX-0499C
25 RPX-0500C

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0501C
2 RPX-0502C
3 RPX-0503C
4 RPX-0504C
5 RPX-0505C
6 RPX-0506C
7 RPX-0507C
8 RPX-0508C
9 RPX-0509C
10 RPX-0510C
11 RPX-0511C
12 RPX-0512C
13 RPX-0513C
14 RPX-0514C
15 RPX-0515C
16 RPX-0516C
17 RPX-0517C
18 RPX-0518C
19 RPX-0519C
20 RPX-0520C
21 RPX-0521C
22 RPX-0522C
23 RPX-0523C
24 RPX-0524C
25 RPX-0525C

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0526C
2 RPX-0527C
3 RPX-0528C
4 RPX-0529C
5 RPX-0530C
6 RPX-0531C
7 RPX-0532C
8 RPX-0533C
9 RPX-0534C
10 RPX-0535C
11 RPX-0536C
12 RPX-0537C
13 RPX-0538C
14 RPX-0539C
15 RPX-0540C
16 RPX-0541C
17 RPX-0542C
18 RPX-0543C
19 RPX-0544C
20 RPX-0545C
21 RPX-0546C
22 RPX-0547C
23 RPX-0548C
24 RPX-0549C
25 RPX-0550C

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0551C
2 RPX-0552C
3 RPX-0553C
4 RPX-0554C
5 RPX-0555C
6 RPX-0556C
7 RPX-0557C
8 RPX-0558C
9 RPX-0559C
10 RPX-0560C
11 RPX-0561C
12 RPX-0562C
13 RPX-0563C
14 RPX-0564C
15 RPX-0565C
16 RPX-0566C
17 RPX-0569C
18 RPX-0570C
19 RPX-0579C
20 RPX-0587
21 RPX-0588
22 RPX-0589
23 RPX-0590
24 RPX-0591
25 RPX-0592

Heritage Reporting Corporation
(202) 628-4888

1 RPX-0593
2 RPX-0594
3 RPX-0595
4 RPX-0596
5 RPX-0597
6 RPX-0598
7 RPX-0599
8 RPX-0600
9 RPX-0601
10 RPX-0602
11 RPX-0603
12 RPX-0604
13 RPX-0605
14 RPX-0606
15 RPX-0607
16 RPX-0608
17 RPX-0609
18 RPX-0610
19 RPX-0611
20 RPX-0612
21 RPX-0613
22 RPX-0614
23 RPX-0615
24 RPX-0616
25 RPX-0617

Heritage Reporting Corporation
(202) 628-4888

- 1 RPX-0618
- 2 RPX-0619
- 3 RPX-0620
- 4 RPX-0621
- 5 RPX-0622
- 6 RPX-0623
- 7 RPX-0625
- 8 RPX-0626
- 9 RPX-0627C
- 10 RPX-0628C
- 11 RPX-0629C
- 12 RPX-0630C
- 13 RPX-0631C
- 14 RPX-0632C
- 15 RPX-0633
- 16 RPX-0634C
- 17 RPX-0635C
- 18 RPX-0636
- 19 RPX-0637
- 20 Parties' Admitted List of Joint Exhibits (JX)
- 21 JX-0001
- 22 JX-0002
- 23 JX-0003
- 24 JX-0004
- 25 JX-0005

Heritage Reporting Corporation
(202) 628-4888

1 JX-0006
2 JX-0007
3 JX-0008
4 JX-0009
5 JX-0010
6 JX-0011
7 JX-0012
8 JX-0013
9 JX-0014
10 JX-0015
11 JX-0017C
12 JX-0018C
13 JX-0022C
14 JX-0023
15 JX-0024
16 JX-0029
17 JX-0456
18 JX-0458
19 JX-0459
20 JX-0460
21 JX-0461
22 JX-0469
23 JX-0471
24 JX-0472
25 JX-0473

Heritage Reporting Corporation
(202) 628-4888

1 JX-0474
2 JX-0475
3 JX-0476
4 JX-0477
5 JX-0478
6 JX-0479
7 JX-0480
8 JX-0481
9 JX-0482
10 JX-0483C
11 JX-0484C
12 JX-0493
13 JX-0494
14 JX-0495
15 JX-0496
16 JX-0497
17 JX-0499
18 JX-0500
19 JX-0501
20 JX-0503
21 JX-0504
22 JX-0506
23 JX-0508
24 JX-0512C
25 JX-0513C

Heritage Reporting Corporation
(202) 628-4888

1 JX-0514C
2 JX-0515C
3 JX-0516C
4 JX-0517C
5 JX-0519C
6 JX-0520C
7 JX-0522C
8 JX-0523C
9 JX-0524C
10 JX-0525C
11 JX-0526C
12 JX-0527C
13 JX-0528C
14 JX-0530C
15 JX-0533C
16 JX-0534C
17 JX-0541C
18 JX-0542C
19 JX-0543C
20 JX-0544C
21 JX-0545C
22 JX-0546C
23 JX-0550C
24 JX-0551C
25 JX-0552C

Heritage Reporting Corporation
(202) 628-4888

1 JX-0553C
2 JX-0554C
3 JX-0555C
4 JX-0556C
5 JX-0558C
6 JX-0559C
7 JX-0560C
8 JX-0563C
9 JX-0564C
10 JX-0565C
11 JX-0566C
12 JX-0567C
13 JX-0568C
14 JX-0569C
15 JX-0570C
16 JX-0571C
17 JX-0572
18 JX-0573
19 JX-0578
20 JX-0580
21 JX-0581C
22 JX-0582C
23 JX-0583C
24 JX-0584C
25 JX-0586

Heritage Reporting Corporation
(202) 628-4888

1 JX-0587
2 JX-0588
3 JX-0589
4 JX-0590
5 JX-0591C
6 JX-0593
7 JX-0594C
8 JX-0595C
9 JX-0602
10 JX-0603
11 JX-0604
12 JX-0605
13 JX-0606
14 JX-0607
15 JX-0608
16 JX-0609
17 JX-0610
18 JX-0611
19 JX-0612
20 JX-0613
21 JX-0614
22 JX-0615
23 JX-0616
24 JX-0617
25 JX-0618

Heritage Reporting Corporation
(202) 628-4888

1 JX-0619
2 JX-0624
3 JX-0625
4 JX-0626
5 JX-0627
6 JX-0628
7 JX-0629
8 JX-0631
9 JX-0632C
10 JX-0633
11 JX-0634
12 JX-0635
13 JX-0636
14 JX-0637C
15 JX-0638C
16 JX-0639C
17 JX-0640
18 JX-0641
19 JX-0642
20 JX-0643
21 JX-0644
22 JX-0645
23 JX-0646
24 JX-0647
25 JX-0648

Heritage Reporting Corporation
(202) 628-4888

1 JX-0649
2 JX-0650
3 JX-0651
4 JX-0652
5 JX-0653
6 JX-0654
7 JX-0655
8 JX-0656
9 JX-0657C
10 JX-0658C
11 JX-0663
12 JX-0667C
13 JX-0668C
14 JX-0669C
15 JX-0670
16 JX-0671
17 JX-0672
18 JX-0673
19 JX-0675C
20 JX-0676C
21 JX-0678C
22 JX-0679C
23 JX-0680C
24 JX-0681
25 JX-0682

Heritage Reporting Corporation
(202) 628-4888

1 JX-0683
2 JX-0684
3 JX-0685
4 JX-0686C
5 JX-0687
6 JX-0688
7 JX-0689
8 JX-0690
9 JX-0691
10 JX-0692
11 JX-0693
12 JX-0694
13 JX-0695C
14 JX-0696
15 JX-0697
16 JX-0698C
17 JX-0699C
18 JX-0700
19 JX-0701
20 JX-0702
21 JX-0703
22 JX-0704
23 JX-0705C
24 JX-0706
25 JX-0707C

Heritage Reporting Corporation
(202) 628-4888

1 JX-0708C
2 JX-0709C
3 JX-0710C
4 JX-0711C
5 JX-0712C
6 JX-0713
7 JX-0714C
8 JX-0715C
9 JX-0716C
10 JX-0717C
11 JX-0718C
12 JX-0719C
13 JX-0720C
14 JX-0721C
15 JX-0722C
16 JX-0723C
17 JX-0724C
18 JX-0725C
19 JX-0726C
20 JX-0727C
21 JX-0728C
22 JX-0729C
23 JX-0730C
24 JX-0731C
25 JX-0732C

Heritage Reporting Corporation
(202) 628-4888

1 JX-0733C
2 JX-0734C
3 JX-0735C
4 JX-0736C
5 JX-0737C
6 JX-0738C
7 JX-0739C
8 JX-0740C
9 JX-0741C
10 JX-0742C
11 JX-0743C
12 JX-0744C
13 JX-0745C
14 JX-0746C
15 JX-0747C
16 JX-0748C
17 JX-0749C
18 JX-0750C
19 JX-0751C
20 JX-0752C
21 JX-0753C
22 JX-0754C
23 JX-0755C
24 JX-0756C
25 JX-0757C

Heritage Reporting Corporation
(202) 628-4888

1 JX-0758C
2 JX-0759
3 JX-0760
4 JX-0761
5 JX-0762
6 JX-0763
7 JX-0764
8 JX-0765
9 JX-0766C
10 JX-0767C
11 JX-0768C
12 JX-0769C
13 JX-0770C
14 JX-0771C
15 JX-0772C
16 JX-0773C
17 JX-0774C
18 JX-0775C
19 JX-0776C
20 JX-0777C
21 JX-0778C
22 JX-0779C
23 JX-0780C
24 JX-0781C
25 JX-0782C

Heritage Reporting Corporation
(202) 628-4888

1 JX-0783C
2 JX-0784C
3 JX-0785C
4 JX-0786C
5 JX-0787C
6 JX-0788C
7 JX-0789C
8 JX-0790C
9 JX-0791C
10 JX-0792C
11 JX-0793C
12 JX-0794C
13 JX-0795C
14 JX-0796C
15 JX-0797C
16 JX-0798C
17 JX-0799C
18 JX-0800C
19 JX-0801C
20 JX-0802C
21 JX-0803C
22 JX-0804C
23 JX-0805C
24 JX-0806C
25 JX-0807C

Heritage Reporting Corporation
(202) 628-4888

1 JX-0808C
2 JX-0809
3 JX-0810
4 JX-0811
5 JX-0853C
6 JX-0854C
7 JX-0855C
8 JX-0856C
9 JX-0858C
10 JX-0859C
11 JX-0860C
12 JX-0861C
13 JX-0862C
14 JX-0863C
15 JX-0864C
16 JX-0865C
17 JX-0867C
18 JX-0868C
19 JX-0869C
20 JX-0870C
21 JX-0871C
22 JX-0872
23 JX-0873C
24 JX-0874C
25 JX-0875C

Heritage Reporting Corporation
(202) 628-4888

1 JX-0876C
2 JX-0877C
3 JX-0878C
4 JX-0879C
5 JX-0880C
6 JX-0881C
7 JX-0882C
8 JX-0883C
9 JX-0884C
10 JX-0885C
11 JX-0886C
12 JX-0887C
13 JX-0888C
14 JX-0889C
15 JX-0890C
16 JX-0891C
17 JX-0894C
18 JX-0895C
19 JX-0896C
20 JX-0897C
21 JX-0898C
22 JX-0899
23 JX-0900
24 JX-0901
25 JX-0902C

Heritage Reporting Corporation
(202) 628-4888

1 JX-0903
2 JX-0904C
3 JX-0905C
4 JX-0906
5 JX-0907
6 JX-0909C
7 JX-0910
8 JX-0911
9 JX-0912
10 JX-0913C
11 JX-0914
12 JX-0915
13 JX-0916
14 JX-0917
15 JX-0919
16 JX-0920
17 JX-0921
18 JX-0922
19 JX-0923
20 JX-0924
21 JX-0925
22 JX-0926C
23 JX-0927C
24 JX-0928C
25 JX-0929C

Heritage Reporting Corporation
(202) 628-4888

1 JX-0930C
2 JX-0931C
3 JX-0932
4 JX-0933
5 JX-0934
6 JX-0935
7 JX-0936
8 JX-0937
9 JX-0938
10 JX-0939
11 JX-0940
12 JX-0941
13 JX-0942
14 JX-0943
15 JX-0944
16 JX-0945
17 JX-0946
18 JX-0947
19 JX-0954
20 JX-0955
21 JX-0980
22 JX-0981
23 JX-0982
24 JX-0983
25 JX-0984

Heritage Reporting Corporation
(202) 628-4888

1 JX-0985
2 JX-0986
3 JX-0987
4 JX-0988
5 JX-0989
6 JX-0990
7 JX-0991
8 JX-0992
9 JX-0993
10 JX-0994
11 JX-0995
12 JX-0996
13 JX-0997
14 JX-0998
15 JX-0999
16 JX-1000
17 JX-1001
18 JX-1002
19 JX-1003
20 JX-1004
21 JX-1005
22 JX-1006
23 JX-1007
24 JX-1008
25 JX-1009

Heritage Reporting Corporation
(202) 628-4888

1 JX-1010
2 JX-1011
3 JX-1012
4 JX-1013
5 JX-1014
6 JX-1015
7 JX-1016
8 JX-1017
9 JX-1018
10 JX-1019
11 JX-1020
12 JX-1021
13 JX-1022
14 JX-1023
15 JX-1024
16 JX-1025
17 JX-1026
18 JX-1027
19 JX-1028
20 JX-1029
21 JX-1030
22 JX-1031
23 JX-1032
24 JX-1033
25 JX-1034

Heritage Reporting Corporation
(202) 628-4888

1 JX-1035
2 JX-1036
3 JX-1037
4 JX-1038
5 JX-1039
6 JX-1041
7 JX-1042
8 JX-1043
9 JX-1044
10 JX-1045
11 JX-1046
12 JX-1047
13 JX-1048
14 JX-1049
15 JX-1050
16 JX-1051
17 JX-1052
18 JX-1053
19 JX-1054
20 JX-1055
21 JX-1056
22 JX-1059
23 JX-1060
24 JX-1061
25 JX-1062

Heritage Reporting Corporation
(202) 628-4888

1 JX-1063
2 JX-1064
3 JX-1065
4 JX-1066
5 JX-1067
6 JX-1068
7 JX-1069
8 JX-1070
9 JX-1071
10 JX-1072
11 JX-1073
12 JX-1074
13 JX-1075
14 JX-1076
15 JX-1077
16 JX-1078
17 JX-1079
18 JX-1080
19 JX-1081
20 JX-1082
21 JX-1083
22 JX-1084
23 JX-1085
24 JX-1086
25 JX-1087

Heritage Reporting Corporation
(202) 628-4888

1 JX-1088
2 JX-1089
3 JX-1090
4 JX-1091
5 JX-1092
6 JX-1093
7 JX-1094
8 JX-1095
9 JX-1097C
10 JX-1101C
11 JX-1102C
12 JX-1103C
13 JX-1104C
14 JX-1105C
15 JX-1106C
16 JX-1107C
17 JX-1108C
18 JX-1109C
19 JX-1110C
20 JX-1111C
21 JX-1112C
22 JX-1113C
23 JX-1114C
24 JX-1115C
25 JX-1116C

Heritage Reporting Corporation
(202) 628-4888

1 JX-1117C
2 JX-1118C
3 JX-1119C
4 JX-1120C
5 JX-1121C
6 JX-1122C
7 JX-1123C
8 JX-1125C
9 JX-1126C
10 JX-1127C
11 JX-1128C
12 JX-1129
13 JX-1130C
14 JX-1131
15 JX-1132C
16 JX-1133
17 JX-1134
18 JX-1135
19 JX-1140C
20 JX-1141C
21 JX-1142C
22 JX-1143C
23 JX-1144C
24 JX-1145C
25 JX-1146C

Heritage Reporting Corporation
(202) 628-4888

1 JX-1147
2 JX-1148
3 JX-1149
4 JX-1151
5 JX-1152
6 JX-1153
7 JX-1154
8 JX-1155
9 JX-1156
10 JX-1159
11 JX-1160
12 JX-1161
13 JX-1162
14 JX-1163
15 JX-1164
16 JX-1165
17 JX-1166
18 JX-1168
19 JX-1169
20 JX-1170
21 JX-1171
22 JX-1172
23 JX-1173
24 JX-1174
25 JX-1175

Heritage Reporting Corporation
(202) 628-4888

1 JX-1176
2 JX-1178
3 JX-1179
4 JX-1180
5 JX-1181
6 JX-1182
7 JX-1183
8 JX-1184
9 JX-1185
10 JX-1186
11 JX-1187
12 JX-1188
13 JX-1189
14 JX-1190
15 JX-1191
16 JX-1192
17 JX-1193
18 JX-1195
19 JX-1196
20 JX-1197
21 JX-1198
22 JX-1199
23 JX-1200
24 JX-1207
25 JX-1208

Heritage Reporting Corporation
(202) 628-4888

1 JX-1209
2 JX-1222
3 JX-1223
4 JX-1224
5 JX-1227
6 JX-1228
7 JX-1233
8 JX-1238
9 JX-1239
10 JX-1240
11 JX-1241
12 JX-1242
13 JX-1243
14 JX-1244
15 JX-1245
16 JX-1246
17 JX-1247
18 JX-1254
19 JX-1255
20 JX-1256
21 JX-1257
22 JX-1258
23 JX-1259
24 JX-1260
25 JX-1261

Heritage Reporting Corporation
(202) 628-4888

1 JX-1266
2 JX-1267
3 JX-1274
4 JX-1301
5 JX-1302
6 JX-1304C
7 JX-1305C
8 JX-1306C
9 JX-1307C
10 JX-1308C
11 JX-1310
12 JX-1311
13 JX-1312
14 JX-1313
15 JX-1314
16 JX-1315
17 JX-1316
18 JX-1324
19 JX-1329
20 JX-1331
21 JX-1333
22 JX-1334
23 JX-1351C
24 JX-1352C
25 JX-1353C

Heritage Reporting Corporation
(202) 628-4888

1 JX-1354C
2 JX-1355C
3 JX-1356C
4 JX-1357C
5 JX-1358C
6 JX-1359C
7 JX-1360C
8 JX-1361C
9 JX-1362C
10 JX-1363C
11 JX-1364C
12 JX-1365C
13 JX-1366C
14 JX-1367C
15 JX-1368C
16 JX-1369C
17 JX-1373C
18 JX-1374C
19 JX-1375C
20 JX-1378C
21 JX-1379
22 JX-1380C
23 JX-1382
24 JX-1383C
25 JX-1384C

Heritage Reporting Corporation
(202) 628-4888

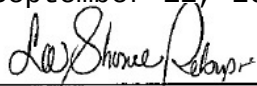
1 JX-1385C
2 JX-1387
3 JX-1388C
4 JX-1389C
5 JX-1390C
6 JX-1391
7 JX-1393
8 JX-1394
9 JX-1395
10 JX-1396
11 JX-1398
12 JX-1403
13 JX-1404
14 JX-1405
15 JX-1406
16 JX-1407
17 JX-1418
18 JX-1426
19 JX-1489C
20
21
22
23
24
25

Heritage Reporting Corporation
(202) 628-4888

1 CERTIFICATE OF REPORTER
 2 TITLE: Certain Video Capable Electronic Devices
 3 INVESTIGATION NO: 337-TA-1380
 4 HEARING DATE: September 10, 2024
 5 LOCATION: Courtroom A
 6 NATURE OF HEARING: Evidentiary Hearing

7 I hereby certify that the foregoing/attached
 8 transcript is a true, correct and complete record of the
 9 above-referenced proceedings of the U.S. International
 Trade Commission.

9 Date: September 12, 2024

10 SIGNED: 

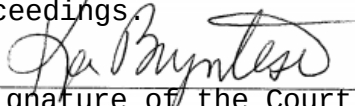
11 Signature of the Contractor of the
 12 Authorized Contractor's Representative
 1220 L Street, N.W., Suite 206
 Washington, D.C. 20005

13 I hereby certify that I am not the Court Reporter
 14 and that I have proofread the above-referenced transcript
 15 of the proceedings of the U.S. International Trade
 Commission, against the aforementioned Court Reporter's
 16 notes and recordings, for accuracy in transcription in the
 spelling, hyphenation, punctuation and speaker
 identification and did not make any changes of a
 17 substantive nature. The foregoing/attached transcript is a
 true, correct and complete transcription of the
 18 proceedings.

19 SIGNED: 

Signature of Proofreader

20 I hereby certify that I reported the above-referenced
 21 proceedings of the U.S. International Trade Commission and
 caused to be prepared from my tapes and notes of the
 22 proceedings a true, correct and complete verbatim recording
 of the proceedings.

23 SIGNED: 

24 Signature of the Court Reporter

25

Heritage Reporting Corporation
 (202) 628-4888

UNITED STATES INTERNATIONAL TRADE COMMISSION

In the Matter of:	)	Investigation No.
CERTAIN VIDEO CAPABLE ELECTRONIC	)	337-TA-1380
DEVICES, INCLUDING COMPUTERS,	)	
STREAMING DEVICES, TELEVISIONS,	)	
AND COMPONENTS AND	)	
MODULES THEREOF	)	

OPEN SESSIONS

Pages: 1020 through 1307 (with excerpts)
Place: Washington, D.C.
Date: September 11, 2024

HERITAGE REPORTING CORPORATION

Official Reporters
1220 L Street, N.W., Suite 206
Washington, D.C. 20005
(202) 628-4888
contracts@hrccourtreporters.com

1 UNITED STATES INTERNATIONAL TRADE COMMISSION
2 Washington, D.C.
3 BEFORE THE HONORABLE CAMERON R. ELLIOT
4 Administrative Law Judge
5 _____

6 In the Matter of:) Investigation No.
7 CERTAIN VIDEO CAPABLE ELECTRONIC) 337-TA-1380
8 DEVICES, INCLUDING COMPUTERS,)
9 STREAMING DEVICES, TELEVISIONS,)
10 AND COMPONENTS AND)
11 MODULES THEREOF)
12 _____

13
14 International Trade Commission
15 500 E Street, S.W.
16 Washington, D.C.
17

18 Wednesday, September 11, 2024
19

20 EVIDENTIARY HEARING - VOLUME III
21

22 The Hearing commenced in Courtroom A, pursuant to the
23 notice of the Judge, at 9:00 a.m. Eastern.
24

25 Reported by: Karen Brynteson, FAPR, RMR, CRR

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES:

2

3 For Complainants Nokia Technologies Oy and Nokia
4 Corporation:

5 ADAM D. SWAIN, ESQ.

6 Alston & Bird LLP

7 950 F Street, N.W.

8 Washington, D.C. 20004

9

10 JOHN D. HAYNES, ESQ.

11 NICHOLAS T. TSUI, ESQ.

12 MARK A. McCARTY, ESQ.

13 DAVID S. FRIST, ESQ.

14 Alston & Bird LLP

15 1201 West Peachtree Street

16 Atlanta, GA 30309

17

18 THEODORE STEVENSON, ESQ.

19 Alston & Bird LLP

20 2200 Ross Avenue, Suite 2300

21 Dallas, TX 75201

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 For Complainants Nokia Technologies Oy and Nokia
3 Corporation:

4 JENNIFER D. CIELUCH, ESQ.

5 Alston & Bird LLP

6 90 Park Avenue

7 New York, New York 10016

8

9 WARREN LIPSCHITZ, ESQ.

10 SAM MOORE, ESQ.

11 ERIK B. FOUNTAIN, ESQ.

12 McKool Smith PC

13 300 Crescent Court, Suite 1200

14 Dallas, TX 75201

15

16 R. MITCH VERBONCOEUR, ESQ.

17 JOSHUA J. NEWCOMER, ESQ.

18 McKool Smith PC

19 303 Colorado Street, Suite 2100

20 Austin, TX 78701

21

22 LAUREN SIMENAUER, ESQ.

23 McKool Smith

24 1999 K Street, N.W., Suite 600

25 Washington, DC 20006

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent Amazon.com, Inc. and
3 Amazon.com Services LLC:

4 THOMAS N. MILLIKAN, ESQ.

5 KYLE CANAVERA, ESQ.

6 Perkins Coie LLP

7 11452 El Camino Real, Suite 300

8 San Diego, CA 92130

9

10 VERONICA S. ASCARRUNZ, ESQ.

11 EMILY RICH, ESQ.

12 Perkins Coie LLP

13 700 13th Street, N.W., Suite 800

14 Washington, D.C. 20005

15

16 STEFANI E. SHANBERG, ESQ.

17 ROBIN L. BREWER, ESQ.

18 KARL JOHNSTON, ESQ.

19 Perkins Coie LLP

20 505 Howard Street, Suite 1000

21 San Francisco, CA 94105

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent Amazon.com, Inc. and
3 Amazon.com Services LLC:

4 ANDREW KLEIN, ESQ.

5 Perkins Coie LLP

6 3150 Porter Drive

7 Palo Alto, CA 94304

8

9

10 MARTIN R. BADER, ESQ.

11 RYAN CUNNINGHAM, ESQ.

12 Sheppard, Mullin, Richter & Hampton LLP

13 12275 El Camino Real, Suite 100

14 San Diego, CA 92130

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 STEPHANIE L. ROBERTS, ESQ.

4 Morgan, Lewis & Bockius, LLP

5 1111 Pennsylvania Avenue, N.W.

6 Washington, D.C. 20004

7

8 JASON E. GETTLEMAN, ESQ.

9 COREY R. HOUMAND, ESQ.

10 Morgan, Lewis & Bockius, LLP

11 1400 Page Mill Road

12 Palo Alto, CA 94304

13

14 DAVID J. LEVY, ESQ.

15 RICK L. RAMBO, ESQ.

16 THOMAS R. DAVIS, ESQ.

17 Morgan, Lewis & Bockius, LLP

18 1000 Louisiana Street, Suite 4000

19 Houston, TX 77002

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 BRENT A. HAWKINS, ESQ.

4 Morgan, Lewis & Bockus, LLP

5 One Market Spear Street Tower, 28th Floor

6 San Francisco, CA 94015

7

8 ZACHARY D. MILLER, ESQ.

9 Morgan, Lewis & Bockus, LLP

10 110 North Wacker Drive

11 Chicago, IL 60606

12

13 MATTHEW J. RIZZOLO, ESQ.

14 RYAN BRUNNER, ESQ.

15 Ropes & Gray LLP

16 2099 Pennsylvania Avenue, N.W.

17 Washington, D.C. 20006

18

19 KEVIN J. POST, ESQ.

20 LANCE W. SHAPIRO, ESQ.

21 Ropes & Gray LLP

22 1211 Avenue of the Americas

23 New York, New York 10036

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 SHONG YIN, ESQ.

4 Ropes & Gray LLP

5 1900 University Avenue, 6th Floor

6 East Palo Alto, CA 94303

7

8 For the Office of Unfair Import Investigations:

9 MARISSA DUCCA, ESQ.

10 JEFFREY HSU, ESQ.

11 U.S. International Trade Commission

12 500 E Street, S.W.

13 Washington, D.C. 20436

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1

2

P R O C E E D I N G S

3

(9:00 a.m.)

4

JUDGE ELLIOT: Good morning. Have a seat.

5

6

7

8

9

We're here in the matter of Certain Individual
Capable Electronic Devices, Including Computers, Streaming
Devices, Televisions, and Components and Modules Thereof,
United States International Trade Commission Investigation
No. 337-TA-1380.

10

11

12

My name is Cameron Elliot, Presiding
Administrative Law Judge. May I have appearances from
counsel, please.

13

14

15

MR. SWAIN: Good morning, Your Honor. Adam Swain
from Alston & Bird of behalf of the Nokia Complainants. I'm
bracing for the feedback. Nothing yet.

16

17

18

19

JUDGE ELLIOT: That's fine.

MR. SWAIN: Great. Thank you for fixing that.

And we're joined by the same team as has been here all week,
Your Honor.

20

21

22

23

24

25

JUDGE ELLIOT: Very well.

MS. BREWER: Good morning, Your Honor. Robin
Brewer on behalf of the Amazon Respondents. Andrew Klein
will also be speaking today. And we have members of the
team that have been here this week also present.

JUDGE ELLIOT: Very well. Good morning.

1 MR. MILLER: Zach Miller on behalf of the HP
2 Respondents, Your Honor. You'll also hear from Jason
3 Gettleman and Corey Houmand today, and we have the same team
4 members as well.

5 MS. DUCCA: Good morning, Your Honor. Marissa
6 Ducca from OUII. And with me today is Vu Bui, also from
7 OUII.

8 JUDGE ELLIOT: Good morning.

9 MR. SWAIN: And, Your Honor, with your
10 permission, you had asked us to synch up with Respondents
11 and Staff on the time and where we are and what we're
12 projecting.

13 JUDGE ELLIOT: Yes, go ahead.

14 MR. SWAIN: Great. Thank you, Your Honor. Now,
15 we have synched watches with Respondents and Staff, and as
16 of right now, Nokia through case-in-chief has spent 439
17 minutes, Respondents starting their case-in-chief have spent
18 261 minutes, which means Nokia has 301 minutes remaining and
19 Respondents have 494 minutes remaining. For Staff, they
20 have spent five minutes, and I believe they have 30 minutes
21 left.

22 JUDGE ELLIOT: Very well. And do you have any
23 idea of -- are we proceeding as you expected? I know that
24 the parties stipulated to the admission of certain testimony
25 from 1379, and so we don't have to put on certain witnesses.

1 Are we going to be done by the time you expected?

2 MR. SWAIN: That's a great question, Your Honor.

3 And, First of all, I wanted to correct that the time
4 estimates I just gave don't count the two 15-minute
5 additions for the NEXT advocates that have or will present
6 in this case for either side.

7 JUDGE ELLIOT: Very well.

8 MR. SWAIN: So that gives 316 remaining for Nokia
9 and I believe 509 for Respondents left. But to answer your
10 question more directly, I think we synched up with
11 Respondents. There's 180 minutes left on Friday. And
12 depending upon when we take lunch or how long we take lunch,
13 from Nokia's end, we expect we should end no longer than
14 shortly after lunch, perhaps 2 p.m., or if we go a little
15 bit longer before lunch, possibly before lunch.

16 JUDGE ELLIOT: Very good.

17 MR. SWAIN: But, overall, we are proceeding as
18 expected.

19 JUDGE ELLIOT: Good. Okay. All right. Very
20 good.

21 So, yes, Ms. Brewer.

22 MS. BREWER: No.

23 JUDGE ELLIOT: All right. So anything else we
24 need to talk about before we start in with Dr. Saber again?
25 Is.

1 MR. SWAIN: Nothing from Complainants, Your
2 Honor.

3 MS. BREWER: Apologies. I jumped the gun a
4 little bit. So...

5 JUDGE ELLIOT: I'm sorry, Dr. Saber let me just
6 remind you, sir, you are still under oath.

7 THE WITNESS: Yes, sir.

8 JUDGE ELLIOT: Go ahead.

9 Whereupon--

10 ELI SABER,
11 having been previously duly sworn/affirmed, was examined and
12 testified as follows:

13 DIRECT EXAMINATION -- Resumed

14 BY MS. BREWER:

15 Q. Good morning, Dr. Saber.

16 A. Good morning.

17 Q. How are you doing this morning?

18 A. I'm doing very well.

19 Q. So when we wrapped up yesterday, we had just
20 finished your invalidity opinion on MPEG-1?

21 A. That is correct.

22 Q. So now we're going to jump into your second
23 invalidity opinion on Kim.

24 If we could bring up RDX-98C.52.

25 So starting -- does Kim qualify as prior art to

1 the '321 patent?

2 A. Yes. As you can see from the highlight on the
3 screen, Kim was filed in October 1998, well before the 2002
4 time frame.

5 Q. And as with MPEG-1, before we get into the claim
6 elements, I want to talk a little bit about Kim. What does
7 Kim relate to?

8 A. As you can see from the highlights on the screen,
9 Kim relates to a method for recording and reproducing video
10 data, time-lapsed video data.

11 Q. And what is time-lapsed video data?

12 A. Time lapse would be when you're recording video
13 at a very low frame rate to capture something that's slowly
14 moving, you know, slow growth or slow movement.

15 Q. Is time-lapse data a video sequence like that
16 described in the '321 patent?

17 A. Yes, it would be.

18 Q. Are you relying on a specific embodiment of a
19 time lapse video sequence in Kim for your analysis?

20 A. Yes, I'm relying on an embodiment in Figure 5a,
21 which is on the next slide.

22 Q. Okay. Let's go to slide 53 and look at the video
23 sequence in Figure 5A. What types of pictures are described
24 here?

25 A. As you can see from the excerpt at the top of the

1 screen, this is Figure 5A directly from Kim. And you can
2 see it has I-frames and P-frames just like MPEG-1, the
3 I-frames being the intra and the P-frames being the
4 predicted.

5 Q. If we move to slide 54, does each frame in Figure
6 5A of Kim have an identifier?

7 A. Yes. As you can see from the left side of the
8 slide, I've highlighted the logical address, which is the
9 identifier.

10 Q. What are the components of the logical address in
11 Kim?

12 A. So the components of the logical address are the
13 CAD, the current address, which I will refer to from now on
14 as CAD, and the IAD, which is the indicating address.

15 Q. Going to slide 55, what does Kim say about the
16 decoding process?

17 A. So as you can see, this is Figure 4 in the middle
18 of the screen, directly from Kim. And I've highlighted the
19 box in yellow that is labeled S32, which says, is it a
20 picture frame? If the answer to that is no -- is it a
21 P-picture frame? I'm sorry. If the answer to that is no,
22 then it's an I-frame. And Kim would decode the I-frame and
23 display it.

24 If, on the other hand, the answer is yes, then
25 it's a P-frame. Then Kim would decode the I-frame first,

1 and then followed by the corresponding P-frame that depends
2 from the I-frame.

3 Q. So in both processes, does the decoding have to
4 start with the I-frame?

5 A. That is correct.

6 Q. Now that we have some understanding of Kim, let's
7 see how it aligns with the claims. If we could go to slide
8 56 and start with the preamble of claim 8.

9 Does Kim describe decoding a compressed video
10 sequence?

11 A. Yes. As you can see from the top of the screen
12 where I've highlighted in yellow, Kim describes a
13 reproducing method for reproducing compressed intermittent
14 video data.

15 Q. So does Kim disclose limitation 8a in the
16 preamble of the '321 patent?

17 A. Yes. Kim describes a method for, you know,
18 compressed -- decompressing and compressing video data.

19 Q. Let's go to slide 57 and look at the preamble and
20 structural limitations of claim 10. Does Kim disclose a
21 video decoder?

22 A. As you can see from the excerpt on the right side
23 of the screen, and this is directly, again, from Kim, you
24 can see I've highlighted a decoder 111. So Kim obviously
25 discloses a decoder.

1 Q. Does Kim also disclose a processor and memory?

2 A. Yes. As you can see from the highlights on the
3 screen, Kim explicitly discloses a digital signal processor
4 and a plurality of memory frames as well.

5 Q. Would it have been obvious to a POSITA that you
6 could program the decoder of Kim using computer program code
7 on the memory?

8 A. Yes, it would be. I don't know how you would do
9 this decoding any other way.

10 Q. So does Kim teach limitation 10a, the preamble
11 and structural limitations of the '321 patent?

12 A. Yes, it does.

13 Q. Let's now look at slide 58 and at the limitation
14 that requires decoding an indication of a first image frame
15 of an independent sequence.

16 First, does Kim disclose an independent sequence?

17 A. Absolutely. You can see from the excerpt at the
18 top of the screen, Figure 5A, and I've highlighted in that
19 5A the green box that you see there. And this is
20 essentially an independent sequence which starts with an
21 I-frame followed by a series of P-frames. And it's an
22 independent sequence because it doesn't depend on anything
23 prior to that or after that particular sequence. So all the
24 frames within that sequence are self-contained within that
25 sequence.

1 Q. Does Kim disclose an indication of the first
2 image frame in decoding order of the independent sequence?

3 A. Yes, it absolutely does. You can see in the box
4 that I've highlighted in red on the screen, that's the IAD
5 for the first I-frame in that independent sequence. And
6 that's the indication of the first frame.

7 Q. Is the IAD decoded as part of the video sequence?

8 A. Yes, it would be.

9 Q. And why is that?

10 A. It would be decoded from the bitstream.

11 Q. So does Kim teach limitations 8b and 10b?

12 A. Yes, it does.

13 Q. Turning to slide 59, let's look at the next
14 limitation. Does Kim disclose starting the decoding of the
15 video sequence from the first frame of the independent
16 sequence?

17 A. Yes, it absolutely does. If you look at the
18 Figure 4 that I've talked about earlier, the box highlighted
19 in yellow is labeled S32. And, again, it's that "is it
20 P-picture frame?" If the answer to that is no, then it's an
21 I-frame and it will decode that I-frame. If the answer to
22 that is yes, that it's a P-frame, it will decode the I-frame
23 first and then followed by the corresponding P-frame that
24 depends from that I-frame.

25 Q. So, either way, Kim teaches starting the decoding

1 from the I-frame?

2 A. That's correct.

3 Q. Does Kim teach limitations 8c and 10c?

4 A. Yes. Yes, it does.

5 Q. Let's go to slide 60 and turn to the limitation
6 related to decoding the identifier values.

7 What identifier values does Kim teach?

8 A. The logical address is the identifier values
9 that's made up of CAD and IAD we've talked about.

10 Q. Does the logical address have a numbering scheme?

11 A. Yes, it does. So you can see the CAD refers to
12 the numbering of the frame. You can see when you look at
13 the green sequence there that I've highlighted on the
14 screen, the CAD is 001 for the first frame, followed by 002,
15 003, et cetera.

16 The IAD is 0000 for the first frame, and for the
17 remaining frames, it indicates the frame that they depend
18 from. So, for instance, for frame labeled P2, you can see
19 the IAD is X001, which is the number -- the CAD of the first
20 I-frame.

21 Q. Does Kim teach decoding the logical address
22 values?

23 A. Yes, it does.

24 Q. And how does Kim teach that?

25 A. Decoded from the bitstream.

1 Q. So does Kim teach limitations 8d and 10d?

2 A. Yes, it does.

3 Q. Turning to slide 61, does Kim teach resetting the
4 identifier value for the first frame of the independent
5 sequence?

6 A. Yes, it does. So you can see I mentioned the
7 IAD, and this is the box that's highlighted in red on the
8 screen. So it's 0000 for the sequence in green that you see
9 there on the screen. And that would be reset to 000 at the
10 start of the next sequence.

11 Q. So does Kim teach limitations 8e and 10e?

12 A. Yes, it does.

13 Q. And in your opinion, does Kim invalidate claims 8
14 and 10 of the '321 patent?

15 A. Yes, it does.

16 Q. Does Nokia have any response to your analysis of
17 Kim under Figure 5A?

18 A. No, they do not.

19 Q. If we go to slide 62, what is Nokia's argument
20 that Kim does not invalidate the claims?

21 A. Kim is -- sorry. Nokia is pointing to Figure 5B.
22 And arguing that there are multiple I-frames in that figure.
23 So the -- let's say the number 2 I-frame or 3 I-frame is not
24 the start of an independent sequence.

25 Q. What is your response to Nokia's argument?

1 A. Well, first of all, this embodiment is a multiple
2 camera embodiment, unlike 5A, which is a single camera
3 embodiment. So this embodiment is not relevant to my
4 analysis. I relied on 5A for my analysis.

5 Q. If we go to slide 63, are you aware that Nokia
6 has identified alleged secondary considerations to support
7 the validity of the '321 patent?

8 A. Yes, I am.

9 Q. Starting with the first one, do you believe that
10 the '321 patent fulfilled a long-felt, unmet need with
11 regards to random access?

12 A. No, it did not, because as I pointed out earlier
13 in my slides in my testimony yesterday, random access was
14 defined as an essential feature of MPEG-1, which was
15 published almost a decade before the '321 patent.

16 Q. So not exactly a long-felt, unmet need?

17 A. That is correct.

18 Q. Did the inclusion of random access in H.264,
19 H.265, and AV1 show copying of the '321 patent?

20 A. No, they did not. Again as I pointed out, random
21 access was part of the MPEG-1 standard.

22 Q. How did random access even get into the H.264
23 standard?

24 A. As I testified yesterday, regarding the various
25 story that I had with regards to VCEG and the JVT proposals,

1 so essentially the standards acquired the structure of --
2 the GOP structure from MPEG-1 with a different syntax into
3 the new standard. So it's the same structure as MPEG-1,
4 imported into the new standard with a different syntax.

5 Q. Is the commercial success of H.264 or H.265 and
6 AV1 due to the '321 patent?

7 A. No, it is not.

8 Q. And why is that?

9 A. As you can see when you look at the standards and
10 you flip through the exhibits, the standards have many other
11 features that had nothing to do with random access.

12 Q. Let's go to the next slide. What is the next
13 thing you would like to discuss?

14 A. I would like to talk about the non-infringement
15 of the '321 patent.

16 Q. If we go to slide 65, what products has Nokia
17 accused of infringement?

18 A. On the Amazon side, they've accused the TV, the
19 Fire TV stick, the Fire TV, the Fire Tablet, and the Echo;
20 on the HP side, the laptop and desktop computers.

21 Q. What components of these products has Nokia
22 alleged actually practice the asserted patents?

23 A. On the Amazon side, it's the relevant operating
24 system and chipsets that you see there on the screen. On
25 the right side is the relevant chipsets I have also posted

1 there on the screen.

2 Q. Now, do all of the accused products use AV1?

3 A. No, they do not.

4 Q. Let's go to slide 66.

5 Nokia has pointed to the accused products' use of
6 H.264, H.265, and AV1 for infringement. Do the accused
7 products have features besides the use of those video
8 Codecs?

9 A. Yes. And as you can see from the highlights on
10 the screen, I've summarized a few features. I'll just pick
11 an example. On the left side of the screen, first row, you
12 can see obviously, you know, motion tracking features, smart
13 home capability, document processing, music, AI technology,
14 none of which have anything to do with random access.

15 Q. How would you describe the importance of the '321
16 patent to the accused products?

17 A. I would say minimal to no importance.

18 Q. Okay. So now that we have talked about the
19 accused products, let's get into your non-infringement
20 positions. If we could go to slide 67.

21 What is the first limitation you would like to
22 discuss with respect to non-infringement?

23 A. I would like to discuss limitation 8e, which is
24 resetting the identifier value.

25 Q. Now, what has Nokia pointed to as the identifier

1 values to meet this claim limitation?

2 A. Nokia -- as you can see from the top of the
3 screen, Nokia has pointed, for the H.264 standard, to
4 frame_num and Picture Order Count. For the H.265 standard,
5 they pointed to Picture Order Count. And for the AV1
6 standard, they pointed to OrderHints and RefOrderHints as
7 the identifiers values.

8 Q. How does a decoder identify these values for each
9 image frame?

10 A. They are either decoded directly from the
11 bitstream or they are derived from information that is
12 placed by the encoder in the bitstream.

13 Q. Turning to slide 68, could you please walk
14 through how each of the accused identifier values is
15 determined by the decoder?

16 A. Yes, absolutely. So in this table here, you can
17 see at the top left of the table frame_num from H.264 is
18 located in the slice header. And I provided the reference
19 page there. And Picture Order Count for H.264 is located --
20 is derived from the slice header, and I provided the
21 references to the exhibits there and the excerpts from the
22 exhibits.

23 Picture Order Count in H.265 is also derived from
24 the slice header, and the exhibit references are there along
25 with a little excerpt about it.

1 And then, finally, OrderHints and RefOrderHint
2 are part of the frame header syntax for AV1.

3 Q. Going to slide 69, can you summarize the actions
4 taken at the decoder to reset the accused identifier values
5 of frame_num, OrderHints, or RefOrderHint?

6 A. Yeah. The reset value is assigned by the
7 encoder, as I mentioned earlier, and provided in the
8 bitstream. That reset value would be decoded from the
9 bitstream and stored locally in memory by the decoder and
10 then used to -- to perform that compression --
11 decompression.

12 Q. How does this compare to the resetting disclosed
13 in MPEG-1?

14 A. It's exactly the same.

15 Q. How does Picture Order Count compare to the other
16 accused identifier values?

17 A. It's not all that different. Picture Order Count
18 relies on information that's derived directly from the
19 bitstream. So it's derived from the bitstream and then
20 perform a local calculation.

21 Q. So what is your conclusion if the ALJ finds that
22 the accused identifier values are reset by the decoder?

23 A. Then MPEG-1 would invalidate the claims.

24 Q. And what is your conclusion if the ALJ finds that
25 MPEG-1 does not meet the resetting limitation?

1 A. Then the accused products and standards do not
2 infringe.

3 Q. Let's go to slide 70.

4 What is the next limitation you want to discuss
5 with respect to non-infringement?

6 A. It's limitation 8c, which is starting a decoding
7 of a video sequence from said first image frame of the
8 independent sequence.

9 Q. I see that this limitation refers to both video
10 sequence and independent sequence. Are those the same
11 thing?

12 A. No, they're not. Video sequence would be the
13 entire video sequence. Independent sequence are parts of
14 that video sequence so there can be many independent
15 sequences within this particular video sequence.

16 Q. Turning to slide 71, do H.264, H.265, and AV1
17 include more than one IDR picture or key frame in each video
18 sequence?

19 A. Yes, they do. So as you can see from the
20 illustration at the top of the screen, I've included one
21 entire video sequence made up of three independent
22 sequences. And they're highlighted in blue on the left
23 side, purple and green on the right side. So you can see
24 the blue on the left, purple in the middle, and green on the
25 right.

1 So you have three independent sequences, one
2 video sequence, where on the first one, you have the decode
3 and the reset. And as the decoder is starting decoding
4 process, it hits the next IDR 2, but it doesn't start the
5 decoding for the sequence from the very beginning. It just
6 continues decoding from that point forward.

7 Q. So the H.264, H.265, and AV1 decoders do not
8 start the decoding of the video sequence every single time
9 it receives an indication of an IDR frame or key frame?

10 A. That is correct.

11 Q. Let's go to slide 72. Can you explain why this
12 issue is relevant to your analysis?

13 A. Yes. Nokia has argued that MPEG-1 does not
14 invalidate the claims because it doesn't perform the claim
15 steps every time it decodes an indication of a first frame.

16 Q. If Nokia is right, what does that mean for
17 infringement?

18 A. I'm sorry?

19 Q. If Nokia is right as to how the steps have to be
20 performed, what does that mean for infringement?

21 A. So there would be no infringement.

22 Q. And what is the reason for that?

23 A. Well -- I'm sorry. Because the standards do not
24 perform these claim steps every time they decode an
25 indication of a first frame.

1 Q. Let's go to slide 73. And what is the next and
2 last topic you want to discuss?

3 A. Yes. So I would like to talk about the domestic
4 industry products and the HP redesign.

5 Q. Moving to slide 74, for domestic industry, what
6 has Nokia pointed to as the domestic industry products?

7 A. The Microsoft Surface and the Xbox and -- on the
8 Microsoft side, and on the Samsung side, the Galaxy
9 Smartphones.

10 Q. What has Nokia identified as the components that
11 actually practice the asserted claims?

12 A. Same chipsets as for -- same chipsets.

13 Q. Same chipsets as for the accused products?

14 A. That's correct. Same chipsets.

15 Q. How does Nokia's analysis of the domestic
16 industry products compare to the analysis for the accused
17 products?

18 A. Same analysis.

19 Q. How do your opinions for the domestic industry
20 products compare to the accused products?

21 A. Same opinions.

22 Q. Okay.

23 MS. BREWER: I need to go on the confidential
24 record. This will be HP confidential information.

25 JUDGE ELLIOT: Very well.

1 (Whereupon, the hearing proceeded in confidential
2 session.)

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 MR. HAYNES: Your Honor, John Haynes for Nokia.

3 CROSS-EXAMINATION

4 BY MR. HAYNES:

5 Q. Good morning, Dr. Saber.

6 A. Good morning, sir.

7 Q. Let me see if I can start out with a few things
8 that we can agree on. Okay?

9 A. Absolutely.

10 Q. We heard a lot yesterday and today from you about
11 how MPEG-1 was known.

12 A. Yes.

13 Q. That was known before the '321 patent, right?

14 A. Yes, sir.

15 Q. And that would have been known and the details of
16 MPEG-1 would have been known to the members of the Joint
17 Video Team that were working on developing the H.264
18 standard, right?

19 A. Yes, sir.

20 Q. Those are experts in the field, right?

21 A. Yes, sir.

22 Q. They would have known the intimate details of how
23 MPEG-1 worked. In fact, some of those people probably
24 developed MPEG-1 in the first place, right?

25 A. Yes, sir.

Heritage Reporting Corporation
(202) 628-4888

1 Q. Okay. My question to you, sir, is, if those
2 people knew all about MPEG-1 and exactly how it worked, when
3 Mr. -- when Dr. Hannuksela proposed his invention for the
4 '321 patent, why didn't they say we don't need this; we've
5 already got MPEG-1? That didn't happen, right, sir?

6 A. That's right. They didn't -- they didn't -- they
7 didn't adopt Dr. Hannuksela's invention.

8 Q. But nobody said, Dr. Hannuksela, what you
9 proposed here is exactly what we've already seen in MPEG-1
10 for over a decade, right? That didn't happen?

11 A. I can't speak to what they said. It wasn't
12 adopted.

13 Q. Now, the Patent Office was also aware of the
14 group of picture concepts from MPEG-1, right?

15 A. I can't speak to the Patent Office directly
16 either, sir.

17 Q. Okay. Let's bring up -- I put together some
18 demonstrative slides. Let's bring up CDX-34C.2.

19 This is an excerpt from the '321 patent. You
20 agree with me, sir, that the '321 patent expressly
21 references the existence of groups of pictures containing
22 I-frames and P-frames, right?

23 A. Generally speaking, yes.

24 Q. Yes. So the patent itself recognizes in the
25 background that this concept from MPEG-1 of groups of

1 pictures was known, right?

2 A. Yes.

3 Q. Okay. Now, let's take a look at what you point
4 to specifically in MPEG-1 as invalidating the claims of the
5 '321 patent. Okay?

6 A. Yes, sir.

7 Q. Okay. So just to orient everyone, I have created
8 CDXs that have some of your slides pasted into them. And
9 I'll note for you when I change something on your slide.
10 But this one is just your slide, which is slide 42 from your
11 presentation. You're familiar with this?

12 A. Yes, I am.

13 Q. And here you're discussing element 8b and 10b of
14 the claims, and you're talking about this closed GOP, this
15 closed group of pictures, right?

16 A. I missed the first part of your question. You
17 were turning away from the mic.

18 Q. Sorry. Here you're talking about claim elements
19 8b and 10b, correct?

20 A. Yes, sir.

21 Q. What you've identified as satisfying 8b and 10b
22 is this closed GOP concept from MPEG-1, right?

23 A. Well, I had a whole discussion on this, but yes,
24 that's -- that's where it started.

25 Q. And a closed GOP, you noted in your slide, is a

1 group of pictures that can be independently decoded, right?

2 A. That's correct. That's what it states in MPEG-1.

3 Q. And you would agree with me that a closed group
4 of pictures can contain different types of pictures, such as
5 I pictures, B pictures, and P pictures, right?

6 A. That's correct.

7 Q. And it can also contain multiple examples in one
8 closed group of I pictures, correct?

9 A. I'm sorry?

10 Q. A single closed group of pictures can contain
11 multiple I pictures, correct?

12 A. Yeah, that's correct.

13 Q. And multiple B pictures and multiple P pictures
14 as well, right?

15 A. That's correct.

16 Q. Okay. Now, you understand, in this claim
17 limitation, that it requires decoding from the video
18 sequence an indication of at least one image frame, which is
19 the first image frame in decoding order, correct?

20 A. You read that correctly.

21 Q. Okay. And what you're pointing to as satisfying
22 that particular limitation is a flag in MPEG-1 called the
23 closed_gop flag, right?

24 A. Yeah, that's the indication.

25 Q. And that closed_gop flag is a single bit, right?

1 A. That's correct.

2 Q. It's either a 1 or a 0, right?

3 A. So far we agree.

4 Q. Okay. Now, that closed_gop flag in and of itself
5 does not reference any image frame, correct?

6 A. No, that's not correct.

7 Q. That one-bit flag makes reference to a particular
8 image frame?

9 A. Well, the next frame that comes after that is the
10 first frame in decoding order.

11 Q. I understand that's your opinion, sir. My
12 question is very specific. The closed_gop flag is either a
13 1 or a 0. And all it indicates is whether the GOP is closed
14 or whether it's open. Correct?

15 A. That's correct.

16 Q. Okay. It doesn't specify a particular image
17 frame or a particular image frame address, correct?

18 A. That's not correct.

19 Q. So you believe that the flag that is defined here
20 as being what identifies whether the group of pictures is
21 open or closed specifies a particular image frame?

22 A. Well, it indicates the next -- the first frame in
23 decoding order, yes.

24 Q. Let's go to your slide 44, CDX-34C.5. And we can
25 see here this closed_gop flag, this 1-bit flag, is right

1 here in your slide, the lower left. Do you see that?

2 A. I don't know where "right here" is, sir.

3 Q. So I'm looking at the lower left. There is a
4 syntax, and it has got a group of pictures, and below that,
5 it has got a group_start_code, a time code, and a closed_gop
6 flag. Do you see that?

7 A. That's correct. I see it.

8 Q. What you're pointing to as being the indication
9 of the first image of an independent sequence is the
10 closed_gop flag, right?

11 A. That's correct.

12 Q. But the very first parameter in there is
13 something called a group_start_code, correct?

14 A. Yes, sir.

15 Q. That's a 32-bit field, right?

16 A. Yes, sir.

17 Q. And what that group_start_code does is that's
18 what identifies the beginning of a group of pictures,
19 correct?

20 A. Yes, sir.

21 Q. And then the closed_gop flag indicates whether or
22 not that group of pictures identified by the
23 group_start_code is closed or open, right?

24 A. Yes, sir.

25 Q. Okay. Now, in your examples that you're relying

1 on from MPEG-1 for validity, the closed_gop flag will always
2 be 1 because it has to be 1 for there to be an independent
3 sequence, right?

4 A. I -- can you repeat your question, please?

5 Q. In your example that you rely on for validity in
6 MPEG-1, the closed_gop flag must be a 1 because that's what
7 makes the group of pictures an independent sequence, right?

8 A. It's set to 1 for a closed GOP, yes.

9 Q. Right. And you're only relying on the closed GOP
10 example for invalidity, right, because the claims you
11 understand require an independently decodable sequence,
12 right?

13 A. That's generally correct.

14 Q. Okay. Let's go to the next claim limitation, 8c.
15 Now again this is your slide C.44 and my CDX-34C.5.

16 A. Yes.

17 Q. This limitation requires starting the decoding of
18 the video sequence from said first image frame of the
19 independent sequence. Do you see that?

20 A. You read that correctly.

21 Q. And on your slide, you point to a portion of the
22 MPEG standard where it describes that if playback begins
23 from a random point in the bitstream, the decoder should
24 discard all bits until it finds -- and then you skipped over
25 and highlighted -- "a group of pictures start code," right?

1 A. You're correct.

2 Q. So what you're illustrating here is that if a
3 user were to start trying to play back somewhere in the
4 middle of the sequence, what the MPEG-1 standard says is you
5 would go find the next group of pictures start code and
6 start decoding from there, right?

7 A. That's correct.

8 Q. Right. That is not the closed_gop flag; that's
9 the group of pictures start code, right?

10 A. Well, it would go to group_start_code and it
11 would start decoding, basically, that syntax, yes.

12 Q. Okay. Now, I want to go to CDX-34C.6.

13 Now, here I've underlined something you didn't
14 highlight, which is the same section you point to also says
15 that it's going to look for a sequence start code. Do you
16 see that?

17 A. Yeah, I do.

18 Q. So if, when the user starts trying to play it
19 back, it finds a sequence start code, it's going to start
20 decoding from that point, right?

21 A. That's correct.

22 Q. Okay. And then you also didn't highlight the
23 other element where it can actually start, which is a
24 picture start code which introduces an I-picture, right?

25 A. No, I didn't highlight that.

1 Q. And in MPEG-1, what would happen if a user
2 started trying to play back in the middle, is if it started
3 and it got to an I-frame and that was before a group of
4 pictures start code, it would start decoding from the
5 I-frame, right?

6 A. It could potentially do so, yes.

7 Q. Okay. Let's see if we can figure out how that
8 works. And this is Figure D.19 from the MPEG-1 standard.
9 You're familiar with this, right?

10 A. Yes, I am.

11 Q. Okay. And this -- I didn't list them all here,
12 but there's A, B, and C examples of groups of pictures and
13 the temporal references that apply to those groups of
14 pictures.

15 A. Yeah. I'm familiar with this.

16 Q. Okay. So focusing specifically on example C, and
17 let's just orient ourselves, for example C on the top, we
18 list a series of image frames in display order, right?

19 A. You are correct.

20 Q. And display order is the order in which those
21 image frames will be output for display to the user, right?

22 A. Yes.

23 Q. And the numbers that are below the image frames,
24 the BI, and the B and P, those are what are referred to as
25 temporal references, right?

1 A. I'm sorry, I missed your question.

2 Q. Those are referred to as temporal references, the
3 numbers that are below the pictures?

4 A. Yes.

5 Q. Okay. So in display order, the way MPEG-1 works
6 is it takes the very first picture in display order and
7 gives it a temporal reference of 0, right?

8 A. That's correct.

9 Q. And then it increments that value for each
10 picture in the display order, right?

11 A. Yeah, you are correct.

12 Q. Okay. Now, below that in this Figure D.19, we
13 see it says example C in coded order. And now it has
14 rearranged the pictures, right?

15 A. Yes.

16 Q. And coded order is referring to the order in
17 which the pictures are going to be decoded, right?

18 A. That's correct.

19 Q. Sometimes that's also referred to as bitstream
20 order?

21 A. Yes.

22 Q. And what we see here is, in our sequence of
23 pictures, encoding order is actually different from the
24 order in which the pictures are displayed, right?

25 A. That's correct. In this case, yes.

1 Q. Okay. So let's look at this coding order in
2 example C and see if we can see what would happen if the
3 user started randomly trying to play from the middle of the
4 stream. Okay? So I've just blown this out so you can
5 follow what's happening.

6 So in 34C.10, I put some labels on here just so
7 we can orient ourselves. The thing I labeled as the first
8 image frame of the independent sequence, that would be this
9 first I-frame labeled 1 that is the first image frame in
10 this group of pictures in decoding order, right?

11 A. That's correct.

12 Q. Now, what I want you to assume that what I
13 labeled here is the user tries to start playing back at this
14 B-4 picture. Do you see that?

15 A. Yes.

16 Q. Let's see if we can figure out what -- in MPEG-1,
17 what would happen if the user tried to start playing at B-4.
18 If we go to CDX-34C.11, what would happen -- we saw this
19 before -- in this example is the decoder would look, and
20 when it saw that I-frame, it would actually start decoding
21 right there at I-8, right?

22 A. That's one possibility, yes.

23 Q. Well, in this example for this frame, that's what
24 would happen, right?

25 A. Potentially, yes.

1 Q. I'm sorry?

2 A. Potentially, yes.

3 Q. Potentially. Well, we looked at the standard.

4 It says you --

5 A. Yes.

6 Q. -- discard bits until you get the first I-frame.

7 So when it gets to the first I-frame, it's going to stop

8 discarding bits and start playing -- decoding, right?

9 A. Generally speaking, yes.

10 Q. Okay. So in this example, you agree with me that

11 MPEG-1 does not start decoding at the first image frame,

12 correct?

13 A. Yes.

14 Q. And CDX-34C.12, I have labeled what would happen

15 to those frames that came before that first I-frame. We saw

16 this in that prior slide. What MPEG-1 would do is discard

17 all those bits from those prior frames if they had been

18 decoded, right?

19 A. Yes. This is one example, yes.

20 Q. So if I actually tried to start playing back from

21 B-4, really couldn't do that in MPEG-1, right? I would have

22 to wait until I got to at least the next I-frame, right?

23 A. Yes. Generally speaking, yes.

24 Q. Now, I want to move on to the next claim element.

25 This is your slide RDX-98C.45, my slide C.13.

1 And here you're looking at element 8d, right?

2 A. That is correct.

3 Q. And what you've identified as satisfying 8d,
4 which requires decoding identifier values for image frames
5 according to a numbering scheme, you've identified the
6 temporal reference numbers that we talked about earlier,
7 right?

8 A. That is correct.

9 Q. Okay. Now let's go to the final claim element,
10 your slide 46, which is CDX-34C.14. The final element
11 requires resetting the identifier value for the indicated
12 first image frame of the independent sequence, right?

13 A. Yes.

14 Q. And that identifier value that has to be reset
15 here refers back to the identifier value that was decoded in
16 the prior claim element of 8d, right?

17 A. Yes.

18 Q. And the identifier value that is being reset has
19 to be the identifier value that was assigned to the
20 indicated first image frame from claim element 8b, right?

21 A. Yes. Generally speaking, yes.

22 Q. And so in your opinion, and what you're showing
23 on this slide, is that the identifier value that must be
24 reset in 8e is the temporal reference number for the first
25 image frame in the GOP sequence, right?

1 A. I missed your question.

2 Q. Sure. What you've identified as satisfying this
3 claim element, you point to this first I-picture I-0 in your
4 slide, right?

5 A. In decoding order, yes.

6 Q. Right. And that's where I was headed. You would
7 agree with me that this I-0 -- sorry, that claim elements 8e
8 and 10e require resetting the identifier value for the first
9 indicated image frame from 8e, which has to be the first one
10 in decoding order, right?

11 A. That's correct.

12 Q. And you chose an example here where that I-frame
13 happens to have a temporal reference of zero because in this
14 example that you chose, the I-frame is the first picture in
15 both the display order and the decoding order, right?

16 A. Yeah, that's an embodiment in MPEG-1.

17 Q. That's an example of a GOP, closed group of
18 pictures, right?

19 A. Yeah, that's one of the embodiments in MPEG-1.

20 Q. But it's certainly not the only example of a
21 closed group of pictures in MPEG-1, right?

22 A. That's correct.

23 Q. Now, you would agree with me, sir, that an
24 example that I showed from D.19, the first image frame in
25 decoding order was not an I-picture, right?

1 A. Yes.

2 Q. And in that example, the temporal reference
3 number for the I-picture was a 1, right?

4 A. I don't remember without looking at it, but I
5 assume you're correct, yes.

6 Q. Do you remember this? Does that help you? I'm
7 on CDX-34.11. You see the I has a temporal reference number
8 of 1?

9 A. You're correct.

10 Q. In that example, it would not reset the
11 identifier value for the first indicated image frame because
12 it doesn't reset that 1, right?

13 A. That's a different embodiment, as I mentioned in
14 my slides, yes.

15 Q. Focused on this embodiment that's on my slide 11,
16 right, and that embodiment, it doesn't reset the I-frame to
17 0 because the I-frame in this example is not the first image
18 in display order, right?

19 A. You're correct.

20 Q. And that's because the temporal reference values
21 in MPEG-1 are reset to 0 for the very first image in display
22 order, right?

23 A. That's correct.

24 Q. Okay. Now, you would agree with me that at the
25 decoder, when it receives this temporal reference number and

1 it sees that it's a 0, it's not going to know from that 0
2 whether what it's looking at is the first picture in
3 decoding -- sorry, in decoding order or not, right?

4 A. Generally speaking, yes.

5 Q. Because it could be some other value, if I
6 rearranged the pictures in decoding order, right?

7 A. That's correct.

8 Q. So that temporal reference number doesn't
9 actually tell the decoder what the decoding order is, right?

10 A. The temporal reference indicates the display
11 order.

12 Q. Correct. I think we agree on that. Okay.

13 Back to where we were. Now we're looking at the
14 final limitation, again, this resetting. Now, you would
15 agree with me that claim element 8e and 10e requires
16 resetting the identifier value by the decoder as opposed to
17 the encoder, right?

18 A. That's correct.

19 Q. And you would agree with me that just reading a
20 number from the bitstream where the encoder has reset it,
21 that would not satisfy claim elements 8e and 10e, in your
22 opinion, right?

23 A. It would be obvious to reset it, but, yes.

24 Q. That wasn't my question, sir. It would not meet
25 the claim limitation to just read a value that was reset by

1 an encoder, because the claim requires that the resetting be
2 done by the decoder, right, sir?

3 A. That's correct.

4 Q. Okay. We also saw this slide yesterday. This is
5 your C.47, my 34C.15. And you use this as an example of
6 saying that what is described in MPEG-1 is also described in
7 the patent, right?

8 A. That's correct.

9 Q. But what you pointed to in the patent that
10 matches what's in MPEG-1 is talking about what the encoder
11 does, right?

12 A. That's correct. That's in the context of the
13 encoder.

14 Q. Right. It's not talking about what the decoder
15 does, right?

16 A. That's correct.

17 Q. Okay. All right.

18 This is your slide 27 that we talked about
19 yesterday. Do you recall this generally?

20 A. Yes.

21 Q. And when you talked about this slide, as you can
22 see from the title of your slide, you say JVT proposals
23 changed the syntax of MPEG's GOPs, not function." Right?

24 A. You read it correctly.

25 Q. And, actually, I was going to help you out in

1 case you couldn't remember it. In CDX-34C.18, this is your
2 testimony. And you're really emphasizing that the only
3 thing that changed was the syntax, right?

4 A. That's correct.

5 Q. Then you went on and you said that was an
6 important -- it's important to distinguish between syntax
7 and functionality, and in your view, the only thing that
8 changed between what was in the proposals and MPEG was just
9 syntax; same functionality, right?

10 A. They adopted the same functionality from MPEG,
11 yes.

12 Q. And we see on the right here, you had some
13 excerpts from the B041 contribution from Dr. Hannuksela, and
14 you highlighted some specific parts of -- talking about the
15 previous work and the random access for transport purposes
16 from that contribution, right?

17 A. You're correct.

18 Q. And did you select which portions of that
19 document you were going to put into your presentation?

20 A. Yes.

21 Q. Okay. And you chose what to highlight there,
22 right?

23 A. Yes.

24 Q. Okay. So what I want to do now is talk a little
25 bit about what you didn't highlight, and let's look. So if

1 you look in your previous work slide -- or in your slide
2 under previous work, you cut it off at the end of the word
3 "moreover." Right? Do you see that in the upper right?

4 A. Yes, I do.

5 Q. Okay. And what you highlighted there was that
6 the proposed syntax did not follow the syntax of the interim
7 JVT file format. That's what you talked about in your
8 testimony, right?

9 A. You are correct.

10 Q. But you didn't mention that it also differed from
11 the VCEG proposal that came before it because the IP
12 transport framework was different, right?

13 A. I'm sorry?

14 Q. You didn't tell the Judge about how the transport
15 framework was different in Dr. Hannuksela's proposal versus
16 the prior art VCEG proposal, right?

17 A. Are you referring to the IP transport framework
18 there on the screen?

19 Q. Yes.

20 A. Because it's grayed out a little bit. It's hard
21 to read on this screen here.

22 Q. I can go back so you can read it clearly, sir.

23 A. Yes.

24 Q. The parts you highlighted, you didn't mention
25 that there were other differences between what

1 Dr. Hannuksela proposed and what was in this VCEG proposal
2 that you talked about from Sony, right?

3 A. You're specifically asking about the IP transport
4 framework?

5 Q. That's one additional difference that you didn't
6 talk about yesterday, right?

7 A. It's not relevant, but yes.

8 Q. Okay. And you also didn't talk about the
9 differences in multi-picturing buffering syntax, right?

10 A. Again, not relevant, yes.

11 Q. Okay. But at least you put those on your slide.
12 What I want to talk about now is what you didn't put on your
13 slide.

14 So I took that previous work paragraph and I
15 expanded it so we could read that "moreover" sentence. And
16 we see there that the part you didn't put on your slide is
17 that it says, "VCEG-053/2 did not take into account all the
18 requirements presented in the previous section, such as the
19 relation to multi-picture buffer and to picture numbering.
20 This proposal tries to address all of these issues."

21 Do you see that?

22 A. You read it correctly.

23 Q. Okay. We didn't talk -- we didn't hear anything
24 about that in your direct testimony, right?

25 A. Not relevant, but yes.

1 Q. Okay. Let's look at the next section, right?
2 And we see in your slide, you talked about -- under the
3 heading Random Access for Transport Purposes, you focused on
4 again this language that says, "we propose straightforward
5 modifications to the slice header, in order to detect a
6 random access position from a received bitstream." Do you
7 see that?

8 A. Yes.

9 Q. And that's what you talked about. But, again,
10 you cut the paragraph off at the sentence that says two
11 changes to the current design are needed. Do you see that?

12 A. Yes.

13 Q. Okay. Let's look at what those two changes were.
14 So here on 34C.22, I've included that -- the two bullets
15 that come below that talk about the two changes that were
16 necessary. And you didn't show these bullets in your direct
17 testimony, right?

18 A. That's correct.

19 Q. Okay. And in these bullets, they're making --
20 Dr. Hannuksela is making two proposed changes in order to
21 facilitate the detection of a random access position from
22 the received bitstream, right?

23 A. That's correct.

24 Q. Okay. One of the things he proposes is that the
25 picture number shall be reset to zero in the first picture

1 of an independently decodable GOP. Do you see that?

2 A. You read it correctly.

3 Q. Okay. And the second thing he proposed is that
4 there be a start of GOP parameter that's included in the
5 slice header whenever the picture number is equal to zero
6 and the slice type indicates an intra-slice. Do you see
7 that?

8 A. You read it correctly.

9 Q. You understand that those were the changes that
10 he was proposing to make that were different from the VCEG
11 and MPEG-1 that would allow for random access transport,
12 right?

13 A. Again, these are addressing the syntax, but yes.

14 Q. Okay. Now, one of the things you also testified
15 to is that Dr. Hannuksela -- this notion of random access is
16 not in the claims, right?

17 A. That's correct.

18 Q. Okay. Now, you understand that these two things
19 we just read from CDX-34C.22, those are proposed changes
20 from Dr. Hannuksela that were to facilitate detecting a
21 random access position, right?

22 A. Syntax, not function, yes.

23 Q. Okay. You're going to call those syntax as well?

24 A. Addressing the syntax, yes.

25 Q. Okay. But you agree there's two proposals there

1 for changes that Dr. Hannuksela is proposing to facilitate
2 random access, right?

3 A. For the syntax.

4 Q. But, again, to facilitate random access, right?

5 A. To address the syntax of it, yes.

6 Q. Okay. Now, this is your testimony in slide
7 CDX-34C.23 where you said random access is not contained in
8 the claims, right?

9 A. That's correct.

10 Q. All right. Let's see if we can compare what
11 Dr. Hannuksela proposed versus the claim language. And this
12 is in CDX-34C.24.

13 What I've done there is just taken the two
14 proposals that we just looked at from B041 and I've compared
15 them to the claim language. And you see claim element 8e
16 requires resetting the identifier value for the indicated
17 first image frame of the independent sequence? You see
18 that, right?

19 A. You read it correctly.

20 Q. And then you see in his proposal to B41 that same
21 limitation, right? He proposed the picture number shall be
22 reset to zero in the first picture of an independently
23 decodable GOP, right?

24 A. I see that, but it's not the same thing, but yes.

25 Q. So that proposed change from Dr. Hannuksela is in

1 the claims, right?

2 A. I don't agree with that.

3 Q. You disagree with that?

4 A. Correct.

5 Q. Okay. Let's look at the second one, see if we
6 can maybe agree on this one. In 8b, the claim language
7 requires decoding from the video sequence an indication of
8 at least one image frame. Do you see that?

9 A. You read it correctly.

10 Q. Okay. And in Dr. Hannuksela's B041 proposal,
11 which is RX-31, he proposes that a starter GOP parameter is
12 included in the slice header whenever the picture number is
13 equal to zero and the slice type indicates an intra-slice.
14 Then it says if start of GOP indicates the start of an
15 independently decodable GOP.

16 Do you see that?

17 A. You read it correctly.

18 Q. Okay. So would you agree with me that that
19 proposed change from Dr. Hannuksela is referring to in
20 element 8b of the claims?

21 A. No, I don't agree with that.

22 Q. Okay. You think that's different as well?

23 A. That's correct.

24 Q. When you formed your opinions in this case, that
25 view, that those two things are different, that's important

1 to the opinions that you rendered on validity and
2 infringement, right?

3 A. You are correct.

4 Q. Okay. So if you're wrong about that, we might
5 want to look at your opinions on infringement and invalidity
6 a little skeptically, right?

7 A. I'm not wrong about it, but yes.

8 Q. But you agree, if someone were to disagree with
9 you, that might cast doubt on the entirety of the opinions
10 you've rendered in this case, right?

11 A. No, I don't agree with that.

12 Q. Okay. You also talked about this B109 document,
13 right, and you said, I looked through the standards history
14 and this concept of random access, not proposed by
15 Dr. Hannuksela and not in the claims, right?

16 A. That's correct.

17 Q. Okay. And B109, we see -- this is your slide 28,
18 my slide 34C.25. We see elements 1 and 2 under the heading
19 Instantaneous Decoder Refresh. Do you see that?

20 A. Yes.

21 Q. And this concept of instantaneous decoder refresh
22 is important to the notion of random access in H.264, right?

23 A. It adopted the MPEG functionality that I
24 discussed.

25 Q. That wasn't my question, sir. My question, sir,

1 was, in H.264, this notion of instantaneous decoder refresh
2 is important to the concept of random access, right?

3 A. That's correct.

4 Q. Okay. Now, in this proposal, B109 from
5 Dr. Hannuksela, we see the same two elements we just talked
6 about that he's proposing to change from what existed
7 previously, right? We see under Number 1 and Number 2, in
8 slide -- my slide 34C.25, those same two elements that he's
9 proposing to change in order to facilitate this
10 instantaneous decoder refresh, right?

11 A. Yes, under -- if you read the top of that
12 paragraph, you obviously would notice the word "syntax"
13 mentioned a couple of times.

14 Q. Okay.

15 A. But yes.

16 Q. I understand that that word is very important to
17 you, sir, and you're putting a lot of weight on it. Now I
18 want to talk about what's different. I don't care what you
19 call it. You can call it a monkey, if it suits you. But
20 it's different, right? These are the differences, right?

21 A. It's important to highlight the differences
22 correctly, but yes.

23 Q. Okay. So the two differences that are referenced
24 in B109, those are the same two differences that we saw in
25 B041, right?

1 A. I would have to look at them side by side, but --

2 Q. Luckily for you, I did exactly that. We talked
3 about 1 and 2 on slide 34C.27. Right? These are the two
4 differences that are highlighted there in B109. What I did
5 here is I put -- on one slide, I put it on your timeline
6 slide because I hope that --

7 A. Yes.

8 Q. -- helps show the flow. But in 34C.28 on the
9 left, I've got the two portions that we looked at from B041.
10 In the center, I have got the those same two proposed
11 changes that Dr. Hannuksela resubmitted in B109, and on the
12 right, I've got the claim of the '321 patent, which I
13 understand you believe -- you know the words -- very similar
14 is not claiming what Dr. Hannuksela proposed; is that fair?

15 A. That is correct.

16 Q. Okay. But you'll at least agree with me that the
17 concept from B041 that Dr. Hannuksela proposed, he proposed
18 those same changes in B109?

19 A. That's correct.

20 Q. Okay. Where you disagree with me is you don't
21 think those changes made it into the claims. Is that right?

22 A. That's correct.

23 Q. Okay. All right. Let's talk briefly about your
24 opinions on Kim.

25 A. Sure.

1 Q. Okay? Now, this is your slide where you point to
2 Figure 5A as being the example in Kim that you believe
3 invalidates the asserted claims, right?

4 A. That's correct.

5 Q. And what you point to in Kim for the claim
6 element 8c and 10c are where it starts the decoding. You
7 point to this box S32, right?

8 A. Yes.

9 Q. And then you define there's two paths that
10 determine how you're to start the coding in your view in
11 this reference, right?

12 A. That's correct.

13 Q. Okay. But that's not actually where decoding
14 starts in this Kim reference, is it?

15 A. I don't know what you mean.

16 Q. Well, let me see if I can help you understand it.

17 If we look at the same figure that you pointed
18 to -- and I just want to go two steps earlier to S30.

19 A. Yes.

20 Q. See what it says happens before you ever get to
21 the box that you're relying on that you say is the start of
22 decoding.

23 It says there that "In S30, the image data
24 corresponding to the user's request is transmitted and
25 decoded in the decoder. The decoding process of the

1 decoder, 111, involves reverse quantization and reverse
2 transformation to restore the original image data prior to
3 data compression carried out during recording."

4 Do you see that?

5 A. You read it correctly.

6 Q. That's decoding, right?

7 A. Well, I mean, it is the start -- it could be the
8 start.

9 Q. Exactly. That's the start of decoding, right?

10 A. Well, it's discussing the process, but you can
11 see the flow chart discusses the steps.

12 Q. I agree 100 percent. The flow chart tells you
13 where decoding starts, and it starts here in S30, right?

14 A. Well, that's talking about, you know, initial
15 transformations, but yes.

16 Q. Okay. And, in fact -- I'm on CDX-34C.31. But,
17 in fact, in the Kim reference, I don't even know whether
18 I've got an I-picture or a P-picture or any of those
19 addresses you talked about until I've already decoded all
20 the image data in the prior step S30, right?

21 A. No, that's not correct.

22 Q. Sorry. I didn't catch your answer.

23 A. No, that's not correct.

24 Q. That's not correct?

25 A. I didn't understand your question, but I think --

1 if I understood your question correctly, it's not correct.

2 Q. Okay. Let me just make sure I ask the right
3 question, just in case so we understand each other.

4 You understand that the decoding that happens
5 that starts in step S30 decodes whatever is there.
6 I-picture, P-picture, whatever is there, it's going to
7 decode it in step S30, right?

8 A. Well, that's going to -- it's kind of an
9 initialization of the process, but the process starts -- the
10 part of the process starts in S32.

11 Q. Well, part of the process you're focused on, but
12 the decoding starts in S30, right?

13 A. Well, some of the initial start is there, yes.

14 Q. Now, if I got a P-picture and the user wanted to
15 start playback on a P-picture, that step S30 is going to
16 decode the P-picture. That's how it's going to start the
17 decoding, right?

18 A. No, that would not be correct.

19 Q. Okay. So if it was a P-picture, it would not
20 decode then P-picture and then get down to your box S32 and
21 then check to see whether it was a P-picture or an
22 I-picture?

23 A. Well, it has got to decode the header
24 information, you know, not the data information we're
25 talking about.

1 Q. Okay. And that's what happens in S31. That's
2 where it gets that information that tells it whether it's an
3 I-picture or a P-picture. That's the property type, right?

4 A. Yeah, it determines the type.

5 Q. And that happens before we get to where you say
6 decoding starts in S32, right?

7 A. That's correct. You have to determine the type
8 of picture, and then you start the decoding.

9 Q. Okay. Now, I'm almost out of time here, so let
10 me ask you briefly about your infringement opinions. This
11 is your slide 71, 34C.33.

12 And here you're making the point that under -- I
13 think you said under Nokia's theory, you would not start
14 decoding the video sequence if you had three different IDR
15 groups. Is that right?

16 A. You're paraphrasing my sentence, but what I
17 testified is correct.

18 Q. Okay. But you understand that if I'm doing
19 random access, the whole point of that is to start playing
20 back the video sequence at some random point that the user
21 chooses, right?

22 A. That's the general idea.

23 Q. Right. So a user could, for example, try to
24 start playing back in the middle of the -- start trying to
25 play back the video sequence in the middle of IDR 2, right?

1 A. That's correct.

2 Q. They could start trying to play it back in the
3 middle of IDR 3. That would meet the claim limitation of
4 starting the decoding of the video sequence from said first
5 image of the independent sequence. If the user tried to
6 start in the middle, it would -- that would be starting the
7 video sequence, but then in the claims, it would then go
8 back and find the independent picture, right?

9 A. No, I disagree with that.

10 Q. Okay.

11 MR. HAYNES: Pass the witness, Your Honor.

12 MS. DUCCA: No questions from Staff, Your Honor.

13 JUDGE ELLIOT: Very well.

14 MS. BREWER: Your Honor, I have a very short
15 redirect.

16 REDIRECT EXAMINATION

17 BY MS. BREWER:

18 Q. Dr. Saber, one thing I wanted to confirm, the
19 first picture in decoding order in MPEG-1 is always an
20 I-frame; is that right?

21 A. That's correct.

22 Q. Okay. And in reviewing the proposals, Sony was
23 the one that proposed MPEG-1 as the basis for IDR pictures
24 in H.264; is that correct?

25 A. I didn't hear the first part of your sentence.

1 I'm sorry.

2 Q. So based on your testimony, Sony was the one that
3 proposed using MPEG-1 for IDR pictures in H.264?

4 A. That's correct.

5 Q. And then I want to go back to the example that
6 counsel prepared related to MPEG-1. Do you recall that
7 portion where you put up --

8 A. Yes.

9 Q. -- I think it was D.19 or something.

10 A. Yes.

11 Q. So counsel pointed you to one example where
12 MPEG-1 would not meet the claim limitations of claim 8 and
13 10 of the '321 patent, right?

14 A. That's correct.

15 Q. Are there examples in MPEG-1 that do meet all the
16 claim limitations of these claims?

17 A. Yes. As I showed there in my testimony, D.18A
18 would meet all the limitations of the claims, and as I
19 highlighted that in details in my slides.

20 Q. So did any of counsel's questions change your
21 opinion that MPEG-1 invalidates claims 8 and 10 of the '321
22 patent?

23 A. No, it does not.

24 MS. BREWER: That is all, Your Honor.

25 JUDGE ELLIOT: Very well. Dr. Saber, thank you.

1 MR. HAYNES: No further questions.

2 JUDGE ELLIOT: Thank you.

3 THE WITNESS: Thank you, sir.

4 (The witness stood down.)

5 MS. BREWER: Respondents will be calling
6 Dr. James Storer next.

7 JUDGE ELLIOT: Very well.

8 MR. HAYNES: Your Honor, while we're getting
9 situated, just to let you know some of the --

10 JUDGE ELLIOT: Turn your microphone on.

11 MR. HAYNES: Your Honor, John Haynes. While
12 we're getting situated, just to let Your Honor know, we've
13 agreed with the other side that we would have two
14 cross-examining attorneys by patent. We will object only to
15 our respective patents. And we've worked that out so we
16 don't have two people doing the same thing or duplicating.

17 JUDGE ELLIOT: Understood.

18 Good morning, sir. I need to swear you in.
19 Whereupon--

20 JAMES STORER,
21 having been first duly sworn/affirmed, was examined and
22 testified as follows:

23 THE WITNESS: I do.

24 MR. KLEIN: May I proceed, Your Honor?

25 JUDGE ELLIOT: Yes. I'm sorry. Tell me your

1 name?

2 MR. KLEIN: Andrew Klein on behalf of
3 Respondents.

4 JUDGE ELLIOT: Go ahead.

5 MR. KLEIN: Thank you.

6 MR. HAYNES: Your Honor, before he begins, there
7 was one slide that we maintained an objection to. I'm happy
8 to address that now or when the slide first pops up,
9 whatever is more convenient for Your Honor.

10 JUDGE ELLIOT: All right. Let me see it now,
11 please.

12 MR. HAYNES: Your Honor, this is the slide we've
13 objected to. It's RDX-97C.85. And what this shows is one
14 particular example of 2.10 from the JVT-Cxxx and JVT-C078
15 documents. This example 2.10, it appears that what they're
16 going to offer are specific opinions about the individual
17 messages and parameters that are contained in this
18 particular example as shown with the numbers 1, 2, 3, 4, in
19 this document.

20 Our objection is there is no discussion of
21 example 2.10 anywhere in Dr. Storer's expert reports. We
22 raised this with the other side overnight, and they
23 identified some examples from his report. Those examples
24 show that they believe that the document discloses four
25 parameter sets in general, and then it talks about other

Heritage Reporting Corporation
(202) 628-4888

1 portions of the document that are not this particular
2 example, where they generally say there are four parameter
3 sets and they identify what those four parameter sets are.

4 But there's no discussion going into example 2.10
5 and identifying what the particular elements are. And I
6 don't know exactly what he's going to say those are today
7 because it's not in his report. And that's our objection.
8 We don't know what he's going to say about those four things
9 that they've labeled on this slide. But there is no
10 testimony about them in his report.

11 JUDGE ELLIOT: All right. Can you put that one
12 slide up again? Okay.

13 So the boxes, I'll call them, are all already in
14 evidence, right?

15 MR. HAYNES: Yes. The document is in evidence.
16 We have no objection to the document.

17 JUDGE ELLIOT: And which of these boxes were on
18 CDX-5C, slide 20?

19 MR. HAYNES: I believe what they have done there
20 is take CDX-5C.20, that was Dr. Kia's testimony, and then
21 they've labeled it and included individual items within it.

22 JUDGE ELLIOT: I see. All right. I'll overrule
23 the objection to the demonstrative, but, you know, as per
24 usual, you may object on a question-by-question basis to
25 individual questions you think are outside the scope.

1 MR. HAYNES: Thank you, Your Honor.

2 MR. GETTLEMAN: Thank you.

3 DIRECT EXAMINATION

4 BY MR. KLEIN:

5 Q. Good morning, Dr. Storer.

6 A. Good morning.

7 Q. Can you please introduce yourself to the ALJ,
8 please.

9 A. I'm Jim Storer, James Storer on the record.

10 Q. And have you prepared some slides to help with
11 your testimony today?

12 A. I have.

13 Q. Okay. And are the slides that we see on the
14 screen the slides you prepared?

15 A. Yes.

16 Q. Let's turn to slide 2. What are you going to
17 discuss today?

18 A. Well, I'll briefly mention my background, and
19 then I'll address both the '991 and the '818 patent and also
20 some opinions common to both.

21 Q. Before we get to your opinions, I'd like to start
22 by talking about your background and qualifications.
23 Turning to slide 3, where do you currently work?

24 A. I'm a professor of computer science at Brandeis
25 University.

1 Q. And can you summarize your educational background
2 for us, please.

3 A. Undergraduate at Cornell University, and I did my
4 Master's and Ph.D. at the Department of Electrical
5 Engineering and Computer Science at Princeton University.

6 Q. Turning to slide 4, does this slide show your
7 industry experience?

8 A. Yes.

9 Q. And can you briefly summarize it for us?

10 A. Yes. After graduate school, I worked at Bell
11 Laboratories as a researcher. And then I founded the annual
12 IEEE Data Compression Conference and have been the chair
13 since then. I am a member of the ACM and IEEE. I've
14 received a number of government grants over the years. Some
15 of them have funded the development of compression hardware
16 and software.

17 I have authored some books, a number of academic
18 publications, and so forth.

19 MR. KLEIN: Your Honor, we tender Dr. Storer as
20 an expert in image and video processing, including the
21 subject matter of the '991 and '818 patents.

22 JUDGE ELLIOT: Very well.

23 BY MR. KLEIN:

24 Q. Turning to slide 5, are you aware the parties
25 have proposed levels of ordinary skill in the art?

1 A. I am.

2 Q. And shown on this slide, are those the various
3 levels of skill that have been proposed?

4 A. Yes.

5 Q. At the time of the '991 and '818 patents, were
6 you a person of ordinary skill in the art under any of these
7 proposed definitions?

8 A. I would have qualified at that time, yes.

9 Q. And are the opinions you're about to provide the
10 same under any of the levels of ordinary skill we see here?

11 A. Yes.

12 Q. Dr. Storer, let's turn to talk about the '991
13 patent.

14 Did you hear -- were you here the other day when
15 Dr. Orchard testified?

16 A. I was.

17 Q. Did you hear Dr. Orchard describe the '991
18 patent?

19 A. I did.

20 Q. What was your reaction to Dr. Orchard's testimony
21 about the '991 patent?

22 A. Well, there certainly were plenty of technical
23 aspects, but there was an overall description that I would
24 disagree with, where he was seemingly changing the
25 definition of coded prediction error to include filtering in

1 a way that really didn't correspond to the other documents
2 that he was looking at.

3 Q. Turning to slide 7, can you summarize your
4 opinions with respect to non-infringement and invalidity,
5 please?

6 A. Sure. So, First of all, non-infringement. An
7 H.265 decoder never receives coded prediction error with
8 both transform coefficients and spatial samples. So this is
9 a very important point. It doesn't do these two things
10 together. And we'll see a lot about that. The Sample
11 Adaptive Offset filter, and it's referred to as SAO, is not
12 coded prediction error. And the SAO parameters are not
13 spatial samples. So we'll -- those are non-infringement.

14 Also, invalidity -- well, first of all, most of
15 the '991 patent is admitted prior art. I also talk about a
16 reference that I'll refer to as Koga. And Koga, it's a very
17 strong piece of prior art. It's basically identical to the
18 '991 patent. I mean, truly identical, and we'll see that.

19 I'll also talk about how the claim elements were
20 well-known, routine, and conventional.

21 Q. Looking at slide 8, let's start with the claims.
22 What independent claims has Nokia asserted?

23 A. I've shown them here. Two decoding claims, a
24 method claim, 22, and an apparatus claim, 31.

25 Q. Can you compare independent claims 22 and 31 for

1 us, please?

2 A. I've done that in this slide in the yellow. And,
3 basically, they're the same, except for language that sort
4 of distinguishes a method from an apparatus claim.

5 Q. Is there any difference between the two claims
6 that would affect your opinions on non-infringement or
7 invalidity?

8 A. No.

9 Q. Let's discuss your non-infringement positions
10 regarding the '991. And we'll turn to slide 10.

11 Dr. Storer, what part of the '991 patent are you
12 displaying on the screen?

13 A. This is Figure 3 labeled "encoder."

14 Q. Let's advance the slide. What are you showing
15 here now?

16 A. So this is the figure annotated where, looking at
17 the specifications, you can see the description of each of
18 the boxes and putting texts corresponding to the box number
19 inside the boxes themselves to make it easier to look at the
20 diagram.

21 Q. Was Dr. Orchard shown this diagram during his
22 testimony?

23 A. He was.

24 Q. Does Dr. Orchard disagree with any of the
25 labeling in this diagram?

1 A. He did not. He agreed with it.

2 Q. Why are we looking at the encoder?

3 A. So I've highlighted over on the left the claim
4 language. It says receiving a coded prediction error
5 signal. So, generally, when you read this claim, you first
6 need to sort of talk about what you're receiving. It's
7 natural or necessary to do that, and so we'll go ahead and
8 take a look, first look at the encoder and then go ahead and
9 proceed to the decoding claim.

10 Q. Did you animate this figure to walk us through
11 what's happening in the encoder?

12 A. I did.

13 Q. Let's advance the slide. Where do we start?

14 A. So we'll start up in the upper left. We have an
15 image for encoding a block to be encoded comes in along the
16 red, going to the right. And also coming up from below is
17 the prediction of the block. And now that plus circle
18 computes the difference to get the prediction error signal
19 labeled 320.

20 Q. Do you rely on citations of the '991 patent for
21 your understanding of what is the coded prediction error
22 signal?

23 A. Yes. That's one of the things you can look to.

24 Q. Turn to slide 11.

25 What does the specification of the '991 patent

1 say about coded prediction error signal?

2 A. So, really, there's a consistent discussion of
3 that throughout the specifications, and I've shown some
4 examples here. In addition, you can even see that in the
5 claims. For example, in claim 1, the encoding claim. Let
6 me just read the highlighted text. "A different signal
7 representing differences between sample values of a
8 predicted block of data and values of the original block."

9 And that understanding you see in these passages,
10 these sample passages from the specifications as well. It's
11 a consistent notion throughout the patent.

12 Q. Is claim 1 asserted?

13 A. Claim 1 is not an asserted claim. Again, we're
14 looking towards encoding in order to understand what's being
15 received when we read the decoding claim.

16 Q. Turning to slide 12, and we'll look back to
17 Figure 3, what happens inside prediction error coding block
18 303?

19 A. Okay. So what I've done is, on the left-hand
20 side, I've put coloring in the claim language. And so you
21 can that we have -- on the yellow, we have receiving a coded
22 prediction error signal. We just talked about that. That's
23 coming out of that plus box, 320.

24 And then I've colored the other two -- I've
25 colored three other colors there, coded prediction error

1 signal; I've colored plurality of transform coefficients,
2 that's blue; and plurality of spatial samples, that's green
3 in this diagram.

4 Q. Dr. Storer, can you explain what's happening
5 along the blue or purple path, the plurality of transform
6 coefficients path?

7 A. Sure. So, again, coming out of that plus, we
8 have that prediction error signal. And now it goes into two
9 places, one of the two places being the blue chain where we
10 do transform and quantization. This is something we've
11 probably heard quite a bit about already. And then it
12 proceeds onward to the right.

13 Q. Can you explain what happens along the green
14 path?

15 A. So, again, we split as we come out of the plus
16 and go down also to spatial quantization. And that also
17 goes to the right. So both the blue and the green go into
18 the entropy coding box, 330.

19 Q. What does the entropy coding box do?

20 A. So entropy coding is a well-known term that goes
21 back to the beginning of compression. And it's really the
22 mechanism you use where you have values, one or more values,
23 that you need to communicate from one end to the other, and
24 you need to convert them to bits. So you can send them,
25 let's say, across a communication channel, then undo those

1 bits and get the values you're communicating back.

2 It can be a compression method in itself, but a
3 little different in that, with entropy coding, there's no
4 notion of losing something. You get -- when you undo it at
5 the other end, you get exactly the same bits that you sent.
6 So it's called a lossless compression mechanism in the
7 literature very often.

8 Q. Can you give us an example of an entropy coding
9 method?

10 A. One of the most famous examples would be due to a
11 paper of Dennis Huffman in 1951 called Huffman coding. That
12 is H-u-f-f-m-a-n. And Huffman coding has been used
13 throughout the decades in many contexts but certainly in
14 both image and video compression and is present in all --
15 virtually all previous video compression standards.

16 Q. Turning to slide 13, what part of the '991 patent
17 are you showing here?

18 A. So this is Figure 6, decoder.

19 Q. And if we advance the slide, now what are you
20 showing?

21 A. So pretty much the same thing I did for the
22 encoder diagram. I've gone ahead and annotated the boxes
23 with text from -- you read from the specifications to
24 describe what's in the box.

25 Q. Does Dr. Orchard disagree with these annotations?

1 A. He does not.

2 Q. Did you also animate this figure to walk us
3 through what's happening in the decoder?

4 A. Yes, I did.

5 Q. Turn to slide 14. Where does the decoder receive
6 the coded prediction error signal?

7 A. Okay. So it comes in from the lower left in the
8 box, the yellow box, labeled "coded prediction error."

9 Q. And what's included in the coded prediction error
10 signal?

11 A. So you have both a plurality of transform
12 coefficients and a plurality of spatial samples.

13 Q. And what does Dr. Orchard say coded prediction
14 error is?

15 A. So he seems to try to enlarge it to be something
16 different than the characterization we had when we looked at
17 specifications, for example, claim 1, and to include sort of
18 ultimate differences going out to the right in this diagram,
19 which we'll talk about later.

20 Q. Do you agree with Dr. Orchard's opinion?

21 A. No.

22 Q. Why not?

23 A. It's not what's -- well, as we saw earlier in the
24 previous slides, it's not what is described in the
25 specifications. It's not what we're going to see in the

1 operation that's described in this diagram either.

2 Q. Is what's covered by the '991 patent similar to
3 what's in H.265?

4 A. So it's not. A really important point that we're
5 going to get to is we have two things being involved in
6 coded prediction error. We don't have just transform and
7 quantization, which is something that goes way back through
8 compression.

9 There's also spatial. So there's two things
10 together that will form the coded prediction error signal.
11 And that's very different than the standard.

12 Q. Turning to slide 15, what happens to the
13 transform coefficients next?

14 A. Okay. So recall that we came in from the left.
15 We split to go up top. And one of the splits was the blue.
16 And again I have highlighted the claim language with -- to
17 correspond to the colors in the figure. So we go up to
18 inverse quantization, inverse transform. What we're doing
19 then is undoing what the encoder did, where it did transform
20 and quantization.

21 And after undoing that, we're going downward with
22 the purple arrow, the decoded transform information.

23 Q. Looking at slide 16, what happens to the spatial
24 samples?

25 A. So, again, the other line that -- we've had the

1 two lines coming out from upward -- is the green, and I've
2 highlighted that on the left, the plurality of spatial
3 samples decoded to spatial information.

4 So here we have, again, the inverse of what the
5 encoder did, inverse spatial quantizer, and that also, the
6 decoded spatial information, also goes to the -- to that
7 circle labeled with a plus.

8 Q. Turning to slide 17, what happens to the decoded
9 spatial information?

10 A. So we see here in the diagram that we have the
11 two being added together in the first plus. So, actually,
12 let's go take a look at the coloring first in the claim.
13 It's always useful. I've colored the claim language to
14 match what's going on here. We have the adding colored in
15 brown, right, and we have coming down from the top in
16 purple, the decoded transform information. And we have
17 coming in from the left the decoded spatial information
18 there added, okay? And that goes to the right.

19 And we have this -- and now the reconstructed
20 prediction error signal, we now then have the prediction of
21 the frame itself coming up to be added with that. So we
22 have a sum of three things by the time we finish with the
23 second plus circle.

24 Q. Okay. And what happens next to the prediction
25 error signal, 612?

1 A. Okay. So now we actually have this signal and
2 we're going to now -- we've added the three things together.
3 And we now can look forward and see the coloring in the
4 claim.

5 So, again, adding is the brown circle for the
6 plus. We have the three things. Now they're added
7 together, the purple, the peach, and the teal, right? And
8 now it's going out to the right to form the preliminary
9 reconstructed image 618.

10 So we see these things highlighted in the claim
11 on the left. We've added the three things together.
12 They're going out and now proceeding out to the right.

13 Q. Now that the decoder has produced a preliminary
14 reconstructed image, where does it go?

15 A. So it heads out to the right to this box called
16 filtering 620.

17 Q. Is that what we see highlighted in blue on slide
18 19?

19 A. Correct.

20 Q. What kind of a filter might be used in this
21 configuration?

22 A. Well, you could use pretty much anything, but
23 examples that we've seen in this case would include
24 something like deblocking filter or SAO filter.

25 Q. What does a deblocking filter do?

1 A. A deblocking filter, kind of a natural thing,
2 almost as the name suggests, you've even seen in our diagram
3 here how blocks of -- the image is divided into blocks and
4 the image is processed a block at a time doing this coding.
5 And so what happens is when you've decompressed an image,
6 sometimes you see artifacts, the fact that it was done block
7 at a time. You might see a smooth area that has a little --
8 has edges in it or something or looks a little blotchy
9 maybe, just a slight difference, especially if you've zoomed
10 in.

11 And so the deblocking filter can be used to kind
12 of smooth that out or touch that up.

13 Q. Look at slide 20. What does the patent say about
14 the filter?

15 A. So I've highlighted some text here. This is from
16 the '991 specifications. After applying prediction and
17 prediction error decoding processes, the decoder, and the
18 encoder, can also apply additional, additional filtering
19 processes. So it talks about filtering as something that
20 comes later. And, of course, that's indicated in the
21 diagram as well.

22 Q. Does the '991 patent teach that filtering and
23 prediction error decoding are separate processes?

24 A. It does.

25 Q. Turning to slide 21, what else does the patent

1 say about the filter?

2 A. So, again, here's another excerpt from the '991
3 specifications. Once all the image blocks have been
4 processed, once they've been processed, they're passed for
5 filtering. Okay? So, again, filtering is something that
6 comes later. It's not something that's part of what I've
7 circled in yellow.

8 Q. Turning to slide 22, focusing on the filtering
9 block, what does this figure show?

10 A. So this is showing that if you were doing
11 filtering, such as the kind of filtering we've discussed so
12 far, it would be out there. It would be in filtering box
13 620. It wouldn't be in the prediction error decoding, which
14 is the inverse transform and the inverse spatial quantizer.
15 They were added together way back in the upper left there.

16 Q. Where in this figure would SA0 be?

17 A. So SA0 is a filter, and filtering would come
18 later. It would come afterwards over there in the right in
19 box 620.

20 Q. Does the '991 patent reference H.265 or SA0?

21 A. No.

22 Q. What does H.265 say about whether SA0 is a
23 filter?

24 A. It says it's a filter.

25 JUDGE ELLIOT: Mr. Klein, I'd like to take our

1 morning break sometime in the next few minutes. Tell me
2 when a good time is.

3 MR. KLEIN: Now is great, Your Honor.

4 JUDGE ELLIOT: Very good. All right. So I have
5 10:30. Let's come back at 10:45, 10:45.

6 And, sir, during our break please don't discuss
7 your testimony with anyone.

8 THE WITNESS: Great.

9 (A recess was taken at 10:31 a.m., after which
10 the proceedings resumed at 10:45 a.m.)

11 JUDGE ELLIOT: Have a seat. Go ahead.

12 MR. KLEIN: Thank you, Your Honor.

13 BY MR. KLEIN:

14 Q. Dr. Storer, returning to the '991 patent, what
15 does H.265 say about whether SA0 is a filter?

16 A. It says it's a filter.

17 Q. Does it describe it as a separate process?

18 A. Yes.

19 Q. In H.265, where does filtering occur in relation
20 to the reconstructed preliminary image?

21 A. It occurs afterwards.

22 Q. If we turn to slide 23, let's layer on to this
23 figure something else. And can you describe what we're
24 seeing here, Dr. Storer?

25 A. Sure. So over in the left, we see our box that

1 encompasses the computation of the decoding, the prediction
2 error signal, but now -- and we see over in the right, way
3 over in the right, the filtering box. But now what seems to
4 be happening in the way things have been constructed by
5 Nokia is we're suddenly going to try to bundle the filtering
6 into the yellow box instead of the inverse spatial quantizer
7 that's there. Okay?

8 So it's an artificial sort of grabbing, I guess.
9 I sort of think it as artificial grabbing the filtering and
10 trying to use it somehow instead of what it is taught, which
11 is the inverse spatial quantizer.

12 Q. Is that what the dotted blue line represents?

13 A. Yes. I am kind of showing what has been put
14 together, I guess, for the purposes of infringement
15 arguments to separate pieces of what is described in the
16 '991 patent.

17 Q. Turning to slide 24, was Nokia involved in
18 developing the accused SAO filtering?

19 A. No.

20 Q. How did you come to that conclusion?

21 A. By looking at the documents.

22 Q. And have you seen any evidence that Nokia
23 contributed to the SAO filter technology they are accusing?

24 A. No.

25 Q. Turn to slide 25. Who first proposed the SAO

1 filter to the JVT?

2 A. So, again, MediaTek and Samsung. And I have
3 shown, for example, here a cover page of an article by
4 people from those companies.

5 Q. What does this article show?

6 A. So the title, you can see, is Sample Adaptive
7 Offset in HEV Standard. Again, if you remember throughout
8 this thing, HEVC and H.265 are two names of the same thing,
9 Sample Adaptive Offset, SAO.

10 And so I have shown a few quotes here, for
11 example, from the abstract. "In lieu of filtering
12 technique, Sample Adaptive Offset." Another quote down in
13 the lower right, "a new in-loop filtering technique in
14 HEVC." SAO is located after deblocking filter and also
15 belongs to in-loop filtering.

16 Q. Looking at the Figure 1 in the upper right, where
17 is prediction error in the figure?

18 A. So that figure is one that is shown in the cover
19 page there and prediction error, it's in the red box.

20 Q. Where does Sample Adaptive Offset filtering
21 occur?

22 A. It comes later. It's in the blue box, possibly
23 after the deblocking filter.

24 Q. Just to clarify, when does the SAO filter happen
25 relative to reconstructing the image?

1 A. Later on, afterwards. It's not part of decoding
2 the decoded prediction error signal.

3 Q. Look at slide 26. What does H.265 say about the
4 SAO filter?

5 A. It says it's a filter. You see this in the
6 standard. And I have shown a couple of excerpts.

7 Q. And which excerpts are we looking at here,
8 Dr. Storer?

9 A. First of all, you are seeing the title of the
10 section, In-Loop Filtering Process, two, in-loop filters,
11 and one of them being Sample Adaptive Offset filter. It
12 mentions the other deblocking filter as well.

13 And then we also see from the text below the
14 in-loop filtering operations include both deblocking and
15 Sample Adaptive Offset filter operations.

16 Q. Turn to slide 27. What have you highlighted here
17 in the standard?

18 A. So the standard is a big document, okay? This is
19 a portion of the table of contents. And I have shown how
20 above there the residual signal, and residual is a word used
21 to talk about this thing. It's not the same thing, but to
22 talk about it, coded prediction error signaling.

23 And then you see that's in a separate part of the
24 table of contents than SAO filter parameters, which is in a
25 different section.

1 Q. You mentioned residual. What does that mean,
2 Dr. Storer?

3 A. It's a common word that is often used to talk
4 about leftover in some contexts. So it can be used in the
5 context of coded prediction error, for example. It's not
6 the same thing, it's not a definition but it's a common term
7 that occurs in different contexts.

8 Q. Turn to slide 28.

9 Are you showing us another article here,
10 Dr. Storer?

11 A. Yes.

12 Q. And what does this article show?

13 A. So this is -- the title is Overview of the High
14 Efficiency Video Coding, HEV Standard. And the authors
15 include -- the first author being Gary Sullivan. He's a
16 very well-known figure. He's chairman of the committee but
17 he's a primary figure throughout the standards development
18 process over several standards, very well-known.

19 And I have shown some excerpts from that article
20 on the right.

21 Q. What did you find significant about this article?

22 A. Well, a couple of things here. And let me first
23 talk about this issue of transform coding. So, first
24 excerpt I have shown is difference between the original
25 block and his prediction is transformed by a linear spatial

1 transform. HEVC uses transform coding of the prediction
2 error residual in a similar manner as in previous standards.
3 So HEV uses transform coding. It doesn't use -- two things.
4 It uses transform coding.

5 Going further down, again, along the same topic,
6 "therefore, the quantized transform coefficients are
7 constructed by inverse scaling and then inverse transform to
8 duplicate the decoded approximation of the residual signal."
9 So transform coding is something that is in the standard.

10 Now, what about SAO? In the same paragraph,
11 actually, the last quote I will read is "fed into one of the
12 two loop filters to smooth out artifacts induced by
13 block-wise processing and quantization." So here the
14 filters come later. And their function is, we discussed
15 this earlier, the smoothing out or maybe fixing up further a
16 little bit or at least for visual quality the decoded image.

17 Q. For what you just discussed, do the authors of
18 the article call that prediction?

19 A. So where are you pointing to?

20 Q. The testimony you just gave, you know, where
21 you're talking about the filter, do the authors refer to
22 that as prediction?

23 A. I'm not sure where you're reading from here.

24 Q. Just in the excerpts we're seeing on the screen,
25 do the authors refer to the filter as prediction?

1 A. So the filtering comes later. It's not part of
2 the coded prediction, if that's what you're asking. Yes,
3 that's clear from this, yes.

4 Q. Let's turn to slide 29.

5 What data are you showing here?

6 A. So some of what has been presented by Nokia is
7 some software that analyzes output from sample encoded
8 videos called the VQ Analyzer. And so it can show you,
9 display what items appear in the output stream coming from
10 one of the sample encoding experiments.

11 And even here in this analyzer provided by Nokia,
12 you see that SAO filter parameters are something separate.
13 They are listed separately in a different area than the
14 coded prediction error. And the coded prediction error
15 doesn't have spatial information as part of it.

16 Q. Let's turn to slide 30.

17 What do these thumbnails show, Dr. Storer?

18 A. So we have looked at a number of places. And the
19 notion of coded prediction error, that notion, it's
20 consistent across all the documents. It's consistent across
21 the '991 specifications for sure. We saw it in the text and
22 the claims. The creators of SAO, consistent notion of what
23 it is, co-chairs of the standard, the standard itself, and
24 even the VQ Analyzer from Nokia.

25 The coded prediction error, there's a clear

1 understanding of what it is. It doesn't include filtering
2 as Nokia has tried to do with that curvy line we saw, they
3 tried to put the things together.

4 Q. Have you seen any evidence from Nokia that shows
5 SAO is coded prediction error?

6 A. No.

7 Q. Turning to slide 31, why are you showing this
8 excerpt, Dr. Storer?

9 A. Okay. So if we look over at the left, the claim
10 language, receiving a coded prediction error signal and a
11 plurality of spatial samples, which in this case it has been
12 agreed that spatial samples means pixel values.

13 And so I have pointed that first point out on the
14 right, pixel values. And I have shown syntax, okay, from
15 the standard, okay? And none of the SAO syntax elements are
16 pixel values, okay? That's the -- the SAO in H.265
17 standard, the SAO -- it's four very specific parameters
18 through a complex computation are sent and then a
19 computation at the other end. And they apply to an entire
20 block as computation at the other end is performed.

21 Q. Let's turn to slide 32.

22 Do you recall seeing this demonstrative during
23 Dr. Orchard's testimony?

24 A. I do.

25 Q. And what is your opinion of Dr. Orchard's view of

1 the '991 patent?

2 A. So even Dr. Orchard really, when you look at his
3 initial parts of his slides, shows spatial samples, pixel
4 values being sent, not parameters, mathematical parameters,
5 only four of them for a whole block being sent by H.265. So
6 it even kind of supports what I have been saying.

7 Q. Are there errors in Dr. Orchard's depiction of
8 the transform coefficients?

9 A. You know, I wouldn't say that exactly. It's a
10 little misleading in that he doesn't really get into details
11 of how you describe the whole block of transform
12 coefficients, but it's maybe intentionally misleading, but
13 it doesn't really matter. Here the point being it is
14 spatial samples, pixel values that are being sent.

15 Q. Does SA0 use spatial samples like Dr. Orchard is
16 showing here?

17 A. No. So the point is he's describing the '991
18 patent, it's sending spatial pixel values, H.265 standard
19 sends these four -- sends four mathematical parameters that
20 are used for computation over a whole block at the other
21 end.

22 Q. Turning to slide 33, does this slide summarize
23 your non-infringement positions?

24 A. You know, it does. And let me just -- it's
25 short. Let me just read it. There are three important

1 points, okay? The first point, H.265 decoder never receives
2 coded prediction error with both these things, both
3 transform coefficients and spatial samples. This is really
4 the issue, really, the big issue here in looking at the '991
5 patent, comparing it to the standard.

6 Second, big picture reason. H.265's Sample
7 Adaptive Offset is a filter and not coded prediction error.
8 It's something different. It comes later. And there are
9 other consequences. You know, it doesn't -- there's a
10 square peg trying to fit into a round hole here or
11 something. And as a consequence of that, there are other
12 problems also. And one that I pointed is the SAO parameters
13 are not spatial samples.

14 Q. Turning to slide 34, do your opinions on
15 non-infringement apply to all the accused chips in accused
16 versions of Android?

17 A. Yes.

18 Q. All right, Dr. Storer, let's transition to your
19 opinions on invalidity. We will turn to slide 36.

20 In the first bullet you say that most of the '991
21 is admitted prior art. Why do you say that?

22 A. Because it is, right? So one of my subsequent
23 slides will show that.

24 Q. You mentioned Koga on this slide. What is Koga?

25 A. Okay. So the next three bullets address Koga.

1 And Koga is prior art. I refer to it as Koga. It's a
2 patent. And it's really strong prior art. It is basically
3 identical to the '991 patent. We will see that.

4 I mean, really, truly, identical, okay? So a
5 very strong piece of prior art, uses the same, the first
6 bullet uses -- we're still using the consistent definition
7 of coded prediction error that was used in all the other
8 documents, including the '991 patent. It, like the '991,
9 unlike H.265, like the '991, uses both transform and spatial
10 information for the prediction error.

11 And, you know, it decodes spatial information to
12 samples, just like the '991. So really identical to the
13 '991. Again, the '991 and Koga of course are different than
14 H.265.

15 Q. Does Dr. Orchard dispute what Koga teaches?

16 A. You know, it -- mainly he really doesn't. There
17 is this one sort of vague detail he disputes, and I do
18 address that in the slides, so there is one small dispute
19 but, you know, pretty much no.

20 Q. How does Koga's decoding of spatial samples
21 compare to what's in the '991?

22 A. As I mentioned earlier, Koga -- I mean, we will
23 see, it's truly identical, overall, to the '991.

24 Q. Let's turn to slide 37.

25 Why are the green boxes highlighted in Figure 3?

1 A. So here actually I have highlighted all the
2 boxes, the yellow and the green. The green is pointing out
3 really all that could be argued that is new, that is in or
4 that Koga is -- sorry, the '991 patent is framing as new.

5 Q. What are the yellow boxes? What do the yellow
6 boxes mean?

7 A. Those are the things that it admits are known.

8 Q. Turning to slide 38, who is the inventor on the
9 '991 patent?

10 A. I have shown the inventor on the left.

11 Q. What did he say about the '991 patent?

12 A. So here is an excerpt from his deposition. Let
13 me just go to the end that I have highlighted.

14 "Question: Coding prediction error in both the
15 transform and spatial domain was known before this patent?"

16 And he says:

17 "Answer: I think so."

18 Q. Let's turn to slide 39 and look at the Koga
19 patent. Can you explain what you're showing us here?

20 A. Sure. So on the left is the cover page of the
21 Koga patent. And on the right is Figure 1. And you clearly
22 see, again, this is of course the heart of the thing, right?
23 Like the '991, Koga has two things, right? It has both
24 transform coefficients and spatial samples for the
25 prediction error.

1 Q. What year was Koga issued as a patent?

2 A. You can see it in the upper left, 19 -- I am
3 having trouble seeing it on my screen -- 1988.

4 Q. Did you prepare slides showing where Koga meets
5 the limitations of the claims?

6 A. Yes.

7 Q. Let's turn to slide 40. What part of Koga are
8 you showing us here?

9 A. Okay. So this is Figure 3, the encoder.

10 Q. Okay. Can you walk us through, what does the red
11 highlighting show?

12 A. Sure. First, let me point out that we have the
13 claim element on the left. And, again, the claim begins
14 with receiving, right? So just like we did with the '991,
15 we first look at the encoder and understand about receiving.
16 And coming in on the left we have the label
17 original image, so a block to be encoded is coming in from
18 the left on the red arrow.

19 Q. What do you have highlighted in teal?

20 A. In teal is the predicted version of that block.
21 In other words, here's the block perhaps you're going to
22 copy from a previous frame to represent this block, and we
23 call that the prediction. That is coming up in teal.

24 Q. What have you highlighted in yellow?

25 A. So this is the prediction error signal where you

1 take the difference. What is really there, the original
2 block and what you're predicting, the predicted block. And
3 you take that difference, the part that is not -- take the
4 difference to get what's not the same, if you will.

5 Q. Let's turn to slide 41.

6 What do you understand about prediction error
7 from Koga?

8 A. Okay. So in Koga, okay, again, just like the
9 '991, unlike H.265, we now will take that and go to two
10 paths. We will go up and we will go down because there is
11 going to be two things involved, not just transform and
12 quantization.

13 Q. What's going on along the top half?

14 A. Okay. So if you look over, again, to the left of
15 the claim language, it has two things, plurality of
16 transform coefficients and plurality of spatial samples, as
17 we have seen before, and the two paths reflect those two
18 things.

19 And the top path, the blue, you see now you're
20 doing the orthogonal transformer, which typically would be
21 the DCT, the discrete cosine transform, which is related to
22 the famous Fourier transforms and known for decades.

23 And that is box 13. And that goes into -- goes
24 over to the right to box 14, which is the quantizer. And
25 after transform and quantization, it proceeds out to the

1 right.

2 Q. Then what is going on along the bottom path?

3 A. Okay. So, again, it comes out, the yellow
4 splits, right, and now we have the two things. We have the
5 second thing. We're going through box 17, the quantizer,
6 taking the spatial, the quantization and that is now a
7 plurality of spatial samples is going out to the right.

8 Q. Turning to slide 42, what happens to the
9 transform coefficients and spatial samples?

10 A. So that goes -- that becomes -- that goes into
11 the coded prediction error and goes out to the right. And
12 now after coding, those bits can be, as we described
13 earlier, similar to -- like the '991, those bits can be
14 transmitted and received at the other end.

15 Q. What does the text on the bottom show?

16 A. I pointed out, we mentioned this earlier, right,
17 there are very well-known methods for coding values or
18 multiple values together known in the past. One of them I
19 mentioned earlier is due to this paper of Dennis Huffman in
20 1951, Huffman coding used for decades and used in all
21 previous video coding standards, as an example.

22 Q. What does Huffman coding allow you to do?

23 A. Say that again?

24 Q. What does Huffman coding allow you to do?

25 A. So it allows you -- again, you know, you have

1 some values you want to communicate, several values. Okay?
2 One or more values. And you want to actually just tell them
3 to the other end. But you're now in the world of bits. You
4 have to somehow turn them into a bitstream and encode them.

5 And Huffman coding does that. It also is a
6 form -- itself a form of compression. We have talked about
7 this before. It's a form of lossless compression, where
8 when you do the coding and then you undo the Huffman coding
9 at the other end, there won't be any notion of losing
10 something or quality. It will be bit by bit identical to
11 what you sent.

12 Q. Dr. Storer, let's turn to slide 43.

13 What part of Koga are you showing here?

14 A. Okay. So I am showing Figure 5, which is
15 depicting the decoder in Koga. It really goes together with
16 Figure 6 because that big box labeled 50, I think, was too
17 big to fit on the one diagram in Koga.

18 So it goes together with Figures 6 to show the
19 full decoder diagram.

20 Q. Let's focus in a little bit. What is in box 50?

21 A. So box 50 is Figure 6. It is labeled inverse
22 code inverter. So box 50 is exactly what Figure 6 displays.

23 Q. Have you animated this figure?

24 A. Yes.

25 Q. What just happened, Dr. Storer?

1 A. There we go. All I did was to put the two
2 figures together, literally inserting Figure 6 which was
3 labeled 50, in Figure 6 as 50 and putting it in place so we
4 can see it all in one place.

5 Q. Turning to slide 45, what are you showing here?

6 A. So this is going to look very familiar. We're
7 working from right to left, very familiar to what we saw
8 with the '991. So coming in from the left is the coded
9 prediction error, okay, and it splits into two paths.

10 And the coloring again I am using to correspond
11 to the coloring of the claim -- in the claim element. So we
12 have the coded prediction error in orange and then you have
13 the two paths, blue being the plurality of transform
14 coefficients and green being the plurality of spatial
15 samples.

16 Q. So to be clear, does Koga show both transform
17 coefficients and spatial samples decoded from the coded
18 prediction error signal?

19 A. Yes.

20 Q. So in your opinion, does Koga satisfy claim
21 element A of claims 22 and 31?

22 A. Yes.

23 Q. Turn to slide 46. What happens to the transform
24 coefficients?

25 A. Okay. So now we have the two -- we have the two

1 paths. And we're going to look at one of them, the blue
2 path. And I have highlighted, again, that in the claim,
3 plurality of transform coefficients, blue, decoded transform
4 information, purple.

5 And so it comes in and it goes to, there is a
6 decoder there labeled 502. That's -- remember what we're
7 doing in a decoder, just like we did with '991, we're
8 undoing what the encoder did. We're going to do inverse
9 quantization. And that takes as input also 504, which are
10 quantization parameters in order to perform the inverse
11 quantization.

12 And then it just proceeds over to box 51, which
13 is labeled inverse orthogonal transformer, for example,
14 inverse DCT, and then output of that, the decoded transform
15 information is one of the two things that is going into the
16 adder labeled 54.

17 Q. Can you give an example of an inverse orthogonal
18 transform?

19 A. Sure. As I just mentioned, discrete cosine
20 transform. It's related to the Fourier transform, the
21 famous Fourier transform. People in math have heard about
22 that. It has been used for decades for both image and video
23 compression. It's present. It's the transform used in
24 virtually all video, even variants of it in the video
25 compression standards.

1 Q. In your opinion, does Koga satisfy claim element
2 B of claims 22 and 31?

3 A. Yes.

4 Q. Turn to slide 47. What happens to the spatial
5 samples?

6 A. Similarly, now we have the other path, the
7 spatial samples go up to, also to the dequantizer that's
8 labeled 501. And it makes also use of quantization
9 parameters from box 503.

10 And after dequantization of that signal, which is
11 like the decoded spatial information, which is labeled with
12 the peach color, also goes into adder 54.

13 Q. Is this the step that Nokia appears to be
14 disputing?

15 A. It appears to be. It appears to be somehow Nokia
16 thinks that this -- somehow the quantization is not there or
17 something.

18 Q. How does the '991 patent teach decoding spatial
19 samples to acquire spatial information?

20 A. I just described it in terms of the figure where
21 we saw the quantization parameters going up from 503 up to
22 the dequantizer 501. But also here is some text in that
23 specification that support it as well.

24 If we look at the left excerpt, decoder 503,
25 okay. So go back and look at the diagram, 503. Those are

1 those quantization parameters. It's adapted to decode
2 correctly the block signal, wherein the prediction error
3 signal from quantizer 17 is encoded.

4 And then on the right, now we're talking about
5 the actual, the quantizer itself, 501. The decoder 501
6 decodes correctly an incoming block signal if, A, the
7 quantization characteristic signal from decoder 503, those
8 are the quantization parameters, is correctly decoded in
9 connection with the incoming block signal and, B, the
10 difference between the prediction error signal and the
11 inverse orthogonal transformation is to be decoded.

12 So to me it's completely clear that it is there,
13 right? It's there. And that's the second signal that goes
14 to -- into adder 54.

15 Q. In your opinion, does Koga satisfy claim element
16 C of claims 22 and 31?

17 A. Yes.

18 Q. Turning to slide 48, is anything else fed to the
19 adder?

20 A. Yes. So, again, remember, what we're doing is
21 undoing what the encoder did. And now let's look at the
22 coloring in the claim just to be sure we know what we're
23 doing. We have the adding in brown, okay, that's that adder
24 that's now going to be adding three things.

25 We have the decoded transform information, right,

1 that came in down there. That's the purple. We have the
2 decoded spatial information that came in. So now you have
3 got your decoded prediction error, but now you want to now
4 add that to the actual prediction. And that's coming up --
5 again, this all looks very similar to the '991, coming up
6 from below. And those three things are added together and
7 now as colored in red and you see the claim decoder
8 representation of the block data is going out to the left.

9 Q. In your opinion, does Koga satisfy claim element
10 D of claims 22 and 31?

11 A. Yes.

12 Q. In addition to a decoder, does Koga also disclose
13 a processor?

14 A. Of course.

15 Q. Does Koga also disclose computer code?

16 A. Yes.

17 Q. And does Koga also disclose memory?

18 A. Yes.

19 Q. Let's take a look at slide 49. Can you point to
20 any differences between the encoder in Koga and the encoder
21 in the '991 patent?

22 A. So the graphics is drawn a little differently,
23 but really when you look at this, it's identical. It's the
24 same. There aren't differences. It is the same thing.

25 Q. If we turn to slide 50 and compare the decoders,

1 can you point to any differences between the decoder in the
2 '991 patent and the decoder in Koga?

3 A. You need a mirror, let's say, because one
4 presentation is being shown right to left and one being
5 shown left to right, but other than that, the mirror image,
6 it's identical.

7 Q. Let's look at the dependent claims. In your
8 opinion does Koga disclose claims 29 and 38?

9 A. Yes.

10 Q. What do the dependent claims require?

11 A. So let me just read the text over on the left.
12 "Wherein at least some of the plurality of spatial samples
13 are decoded as a single unit." That's the claim language.

14 And over on the right I have shown a sample
15 excerpt from Koga where it talks about processing things on
16 a block-by-block basis, and blocks have multiple values in
17 them.

18 Q. What does the '991 patent teach about coding
19 samples as a unit?

20 A. So you can do that. You can also do it here.
21 Koga can also do it, encode things together. And we can do
22 it on a block-by-block basis.

23 Q. Was it known how to do that?

24 A. Certainly. Of course.

25 Q. What does Koga teach about coding multiple

1 symbols as a unit?

2 A. So actually you see that in Koga. And you can
3 use -- you can encode them together. And we saw that and
4 send those bits over the line. You can use Huffman coding,
5 for example.

6 MR. LIPSCHITZ: Objection, Your Honor, we're
7 going beyond the scope of the expert report.

8 JUDGE ELLIOT: Mr. Klein, show me where in the
9 expert report he is talking about this.

10 MR. KLEIN: Storer opening report, paragraph 100.
11 All of these alternatives to the classical
12 Huffman code jointly encode multiple inputs together for
13 increased efficiency, Your Honor.

14 JUDGE ELLIOT: Give me a moment, please.

15 MR. KLEIN: And continuing on to the next
16 sentence, Your Honor.

17 JUDGE ELLIOT: All right. I'm sorry, tell me
18 your name.

19 MR. LIPSCHITZ: Warren Lipschitz, Your Honor.

20 JUDGE ELLIOT: Mr. Lipschitz, yes. Do you want
21 to comment on this?

22 MR. LIPSCHITZ: Yes, Your Honor. This doesn't
23 mention anything about Koga. He was just explaining his
24 interpretation of Koga. I have here his expert report at
25 paragraph 631, if we can please pull that up.

1 And it is one paragraph that is his entire
2 disclosure for this claim limitation. And it doesn't say
3 what he just testified to, Your Honor.

4 JUDGE ELLIOT: Okay. So right now we're looking
5 on the screen at paragraph 100. Can you show me the whole
6 page and then go back to the page before as well? Actually,
7 just go back to the previous page, page 32. Thank you.
8 Okay.

9 And so, Mr. Lipschitz, you're saying which was
10 it, paragraph 631? Can I see paragraph 631, please?

11 MR. LIPSCHITZ: Yes, Your Honor. If you look at
12 631 there, that is the entirety of the analysis for this
13 claim limitation. It doesn't say anything about what the
14 witness was just testifying to and what they pointed to was
15 in paragraph 100, which is not on the section of Koga. And
16 is not describing what is disclosed in Koga.

17 JUDGE ELLIOT: All right. Mr. Klein, do you want
18 to be heard?

19 MR. KLEIN: Yes, Your Honor. So I can rephrase
20 the question to say was it known to do what Dr. Storer was
21 talking about instead of what does Koga teach.

22 JUDGE ELLIOT: Okay. So I will sustain the
23 objection and strike the answer. And why don't you try
24 again, Mr. Klein.

25 MR. KLEIN: Thank you, Your Honor.

1 BY MR. KLEIN:

2 Q. Dr. Storer, was it known how to code samples as a
3 unit?

4 A. Yes, of course.

5 Q. Can you explain why?

6 A. So coding samples as a unit has been known for
7 decades. This is how -- coding goes back to the 1960s. And
8 coding is at the lowest layer of image and video compression
9 standards.

10 You know, after you do all of your quantization
11 and all of your other things that could have loss in them,
12 coding allows you to send bits in a way that is lossless, as
13 I mentioned earlier. You can code them at one end, and one
14 or more values can be coded together, that's obviously
15 well-known for decades.

16 And now at the other end you can receive those
17 bits, undo them, decode them and get back the exact same
18 bits you got when you transferred them, when you transmitted
19 them.

20 Q. In your opinion, does Koga invalidate or render
21 obvious dependent claims 29 and 38?

22 A. Yes.

23 Q. Let's turn to slide 52.

24 Let's transition to some opinions on what was
25 well-known and routine and conventional. Then we will go on

1 to slide 53, Dr. Storer. Do the claims of the '991 patent
2 use technology that was well-known, routine, and
3 conventional?

4 A. Yes. We have already talked about this
5 basically, but things like transform coding, incredibly
6 well-known, right? This is the DCT that goes back to, you
7 know, the very Fourier transform that has been used since
8 1960s in coding and image compression as well, like JPEG.
9 Spatial coding, pixel values, well-known, decades, okay?

10 Mathematical operation just, you know, things
11 like dividing two things and adding together, you know, it
12 is well-known stuff. And I have also added at the end, this
13 is -- claim 22 is a method claim but if you're looking at
14 the apparatus claim, also things like processors, computer
15 code, memory, would be obviously well-known.

16 Q. Is there anything special about the processor in
17 the asserted claims?

18 A. No.

19 Q. Is there anything special about the computer code
20 in the asserted claims?

21 A. No.

22 Q. Is there anything special about the memory in the
23 asserted claims?

24 A. No.

25 Q. Is there anything special about the decoder in

1 the asserted claims?

2 A. No.

3 Q. Does anything about the order or combination of
4 the steps in these claims make them inventive?

5 A. No.

6 Q. All right, Dr. Storer, let's transition to your
7 opinions on the '818 patent. And before we get into
8 substance, what topics are you going to cover for the '818
9 patent?

10 A. Well, I will be discussing both invalidity and
11 non-infringement issues.

12 Q. Turning to slide 55, can you just briefly
13 summarize your opinions on invalidity, please?

14 A. Sure. So think of the three big bullets here,
15 first that Nokia cannot claim an earlier priority date. We
16 will get into that. It's obvious over prior art, and also,
17 you know, the claims use well-known technology. And when I
18 began with the first bullet, that's really three big
19 categories.

20 First of all, there is no reduction to practice,
21 okay. There was no conception. And once you have that,
22 it's -- you have to remember now the '818, the claims -- the
23 '818 patent was filed after the standard was issued.

24 So it's obvious over the issuance of the
25 standard, which is this document here.

1 Q. Turning to slide 56, I would like to start with
2 your opinions on the priority date.

3 Dr. Storer, were you here for Dr. Kia's testimony
4 earlier this week?

5 A. I was.

6 Q. Is what's shown here on slide 56 one of the
7 demonstratives from his presentation?

8 A. Yes.

9 Q. Did you hear Dr. Kia's opinion that the claimed
10 invention was conceived on April 27th and May 1st of 2002?

11 A. I did.

12 Q. Did you hear Dr. Kia's testimony and his opinion
13 Nokia then diligently reduced the invention to practice?

14 A. I did.

15 Q. Do you agree with Dr. Kia's testimony?

16 A. I don't.

17 Q. Why not?

18 A. Okay. First of all, I don't agree with the
19 conception, the earlier conception. And that will be the
20 second -- that was the second bullet we saw before, so we
21 will get to that. And I don't agree that there was a
22 reduction to diligence and reduction to practice.

23 Q. Does Dr. Kia's timeline accurately represent the
24 JVT's development of parameter sets?

25 A. No, it doesn't.

1 Q. In your opinion, is it missing key events showing
2 the development of parameter sets in H.264?

3 A. It is.

4 Q. Are you going to cover those events today?

5 A. Yes.

6 Q. Let's turn to slide 57 and talk about reduction
7 to practice.

8 What do you understand Dr. Kia relies on for
9 reduction to practice?

10 A. So really it seems to be relying on others,
11 people not from Nokia, directing others, people not from
12 Nokia to eventually create an actual implementation of a
13 coder.

14 Q. Let's start with JVT-D145. In your opinion, is
15 JVT-D145 a reduction to practice of the alleged invention?

16 A. So, no. That's a document. It's a paper
17 document produced by a group of people, of individuals.

18 Q. Would a person of ordinary skill in the art know
19 if what was proposed in JVT-D145 would work as it was
20 supposed to?

21 A. So, no. The whole point of creating a reference
22 coder is to verify that, right, and to ferret out any issues
23 that might arise.

24 Q. Has Nokia presented evidence that anyone tested
25 JVT-D145?

1 A. No.

2 Q. And are you aware of any issues JVT-D145 had when
3 it was incorporated into the reference code?

4 A. Yes.

5 Q. So in your opinion, is D145 a reduction to
6 practice of the alleged invention in the '818 patent?

7 A. No.

8 Q. Let's talk about the process of incorporating
9 D145 into the reference code. And we will look at slide 58.
10 Who was originally tasked with implementing D145
11 into the reference code?

12 A. So originally tasked was one of the named
13 inventors, Mr. Hannuksela. And here you see that this
14 document is from him. And I've -- actually, before I read
15 the highlighted text, let me point out the sentence before
16 as well. It says "I have been marked as the implementer of
17 the high-level syntax (JVT-D145), obviously because I acted
18 as the chair of the breakout group that produced the
19 document."

20 Then he goes on to say, "I lack the time, the
21 skills, and the knowledge how to implement JVT-D145 into the
22 software." The time, the skills, and the knowledge. "Thus,
23 I wish somebody else volunteered."

24 Q. Let's break that down a little bit, Dr. Storer.
25 Why was Dr. Hannuksela tasked with implementing

1 D145?

2 A. So you see in that first sentence, he says,
3 "obviously because I acted as the chair of the breakout
4 group."

5 Q. And did Dr. Hannuksela end up implementing D145
6 into the reference code?

7 A. No.

8 Q. Are you aware of any role Dr. Hannuksela had in
9 implementing D145 into the code?

10 A. I'm not aware, but I have seen absolutely no
11 evidence or testimony to that effect.

12 Q. Has Nokia presented any evidence that
13 Dr. Hannuksela was involved in implementing D145 into the
14 reference code?

15 A. No.

16 Q. Let's turn to slide 59.

17 Was Dr. -- or was Mr. Wang the other named
18 inventor involved in implementing D145 into the reference
19 code?

20 A. No. He said he was too busy.

21 Q. And what are we seeing on this slide?

22 A. So let me read the text. This is dated August
23 19th. It says "Kui Wang reports he's too busy to implement
24 himself and also did not find another implementer for
25 JVT-D145."

1 Q. What does this evidence tell you about the
2 inventors' involvement in D145?

3 A. You know, combined with the other slide, too
4 busy, no knowledge, can't do it. Just don't want to be
5 involved.

6 Q. Let's turn to slide 60. What happened next at
7 the JVT regarding implementation of D145?

8 A. So here I have shown a sequence going forward in
9 time. So if we look at the upper left, this is August 20th.
10 We need an implementer for JVT-D145. And that's authored by
11 Mr. Suehring. I saw him testify earlier in this trial.

12 Then we go forward to September 18th.
13 Mr. Wiegand "help," he is trying to find somebody to do
14 this. We go further forward in time to September 27th,
15 again, now Mr. Suehring, "we still, we still need someone."

16 So this search for somebody to do it, because the
17 named inventors just, you know, couldn't do it, wouldn't do
18 it, didn't have the knowledge and were out of the picture.

19 Q. Dr. Storer, were you here when Mr. Suehring
20 testified?

21 A. Yes.

22 Q. Did you hear Mr. Suehring say that he delegated
23 Mr. Wenger to implement D145?

24 A. I did.

25 Q. Let's turn to slide 61. Is that your

1 understanding of what happened based on the evidence you
2 reviewed?

3 A. No. Remember now, Mr. Wenger, he's one of the
4 inventors of the original parameter set concept back in
5 VCEG-N52 in 2001. And he volunteered. "Stephan Wenger
6 acknowledges that he plans to implement not only his
7 proposal but most of the outcome of the breakout group."

8 Q. Who ultimately implemented JVT-D145 into the
9 reference code?

10 A. Mr. Wenger.

11 Q. Was he employed by Nokia at the time?

12 A. No.

13 Q. Who did he work for?

14 A. Actually, I don't recall right now. Sorry.

15 Q. Does this slide indicate where he worked?

16 MR. LIPSCHITZ: Objection, leading, Your Honor.

17 JUDGE ELLIOT: Sustained.

18 THE WITNESS: Okay.

19 BY MR. KLEIN:

20 Q. We can move on.

21 A. Okay. Under his name there, I have indicated
22 Berlin, but okay, sorry.

23 Q. Turn to slide 62. Did you prepare a timeline
24 summarizing the evidence you reviewed in implementing D145
25 into the reference code?

1 A. Yes.

2 Q. Is that what we're seeing on slide 62?

3 A. Yes.

4 Q. Can you describe generally what you have put
5 together here?

6 A. Sure. So we see over here in August 2002, the
7 named inventor -- one of the named inventors is tasked, we
8 talked about this before, with implementing JVT-D145. And
9 then shortly later, you remember that quote, lacks the time,
10 skill, knowledge, can't do it.

11 And shortly after that, the other named inventor
12 can't do it. And now you're going through a time where
13 others, not from Nokia, are involved. And it's not until
14 December 24th, 2002, that finally the reference code is
15 ready.

16 Q. Based on the evidence you reviewed, have you seen
17 any reduction to practice by Nokia of incorporating D145
18 into the reference code?

19 A. No.

20 Q. Switching to diligence, what is your conclusion
21 in terms of whether the time it took to implement JVT-D145
22 into the reference code shows diligence?

23 A. There was not diligence on the part of Nokia.

24 Q. Why do you say that?

25 A. Basically you see this long time frame of, you

1 know, months where -- and I have sort of shown that in the
2 red, where others were working on this, not Nokia. And you
3 see very clearly at the beginning of that timeline where the
4 named inventors just callout just don't have the time,
5 knowledge, whatever, just can't do it and they are not
6 involved.

7 Q. Let's turn to slide 63. And look at the
8 conception. Do you believe the named inventors conceived of
9 the claimed invention on April 27th or May 1st of 2002?

10 A. I do not.

11 Q. Why not?

12 A. So at the highest level, and I will talk about
13 this more later, okay, back at that time, they proposed four
14 parameter sets in a structure. The structure was created
15 with rules for the properties you had to have to be one of
16 these parameter sets, particular sets of rules. Okay?

17 Now you go forward in time to after the standard
18 has been issued and the '818 patent is filed, and there is
19 new material that was shown to the examiner, where it uses
20 different rules in order to get the claims. And I will talk
21 more about that later.

22 Q. Taking a step back, I want to look at the JVT's
23 development of parameter sets. Can we turn to slide 64.

24 Did you prepare a timeline to provide context for
25 the JVT's development of parameter sets?

1 A. I did. And that's what you see here.

2 Q. Can you explain what we're seeing here, please?

3 A. So let's look at the left. I mentioned this
4 earlier. And on the left you see the inventors of VCEG-N52,
5 one of them being Mr. Wenger who we just saw previously, and
6 they propose the parameter set concept. So parameter sets
7 essentially there, if you will, the inventors of parameter
8 sets.

9 And then we now proceed forward and I have
10 indicated in gray there was -- this is what we just
11 mentioned earlier, the JVT-078, this proposal by Nokia,
12 which ended up sort of being a dead end. It wasn't accepted
13 ultimately or used.

14 But shortly thereafter, we do see an e-mail from
15 Gary Sullivan laying out what really became the standard.
16 Remember, Gary Sullivan is chairman of the committee and one
17 of the big figures in standard development throughout the
18 years. And he proposes two parameter sets and also proposes
19 the concept of the picture ID in the slice header.

20 And then going a little further in time,
21 individuals from Sony, okay, in July 2002 actually proposed
22 continuing on with that thought process from Sullivan,
23 proposed two parameter sets in a particular hierarchical
24 arrangement and with picture parameter in the slice ID.

25 Oddly enough, before the breakout group

1 considered proposals, there was yet another proposal from
2 Nokia that also didn't match up with the train of thought
3 that went to developing the standard, where, yeah, they kind
4 of latched on to the idea of two sets, but it uses yet a
5 different set of rules. They weren't nested in something
6 that was, again, different than what came from Sony. And it
7 is what -- after consideration, it's what came from Sony
8 that went on to be in the standard.

9 Q. Do you recall testimony from Dr. Kia that the JVT
10 adopted Nokia's proposal in C078?

11 A. The testimony, say that again?

12 Q. That the JVT adopted Nokia's proposal in C078?

13 A. Yes, I recall that testimony.

14 Q. If that were accurate, do you think this work
15 from these other folks on the timeline would have happened?

16 A. I mean, you can just use common sense here. Why
17 would it? Okay. So that -- those, both those patents we
18 saw from Nokia there were kind of dead ends. And the work
19 that went into it was because that was -- that's what was
20 the right thing to do.

21 And you see this train of thought going from the
22 original work of Wenger and Stockhammer and parameter sets
23 and Gary Sullivan to Sony and consideration by the group and
24 adoption in this standard and implementation.

25 Q. Let's turn to slide 65. I want to go through the

1 documents cited in your timeline. Before we do that, did
2 the named inventors say anything about the effect of using a
3 different number of parameter set types?

4 A. So I am going to talk about this more, but the
5 parameter -- the number of types and the structure and the
6 rules that are used to describe what qualifies for, in that
7 context, for a parameter set, here you see one of the named
8 inventors saying and that can affect the decision criteria
9 on which one goes to where.

10 So design criteria, he's saying that it matters.
11 You know, you sort of say well, what difference does it
12 make? Actually the actual parameter sets that were adopted
13 in the structure that was adopted, it matters.

14 Q. Let's walk through the evidence cited in your
15 timeline. Let's turn to slide 66.

16 Can you explain what VCEG-N52 is?

17 A. Sure. So VCEG-N52, again, we're now back in
18 time, September of 2001. This is, you know, early on. And
19 we have the two authors, Wenger and Stockhammer. We have
20 heard about Mr. Wenger before, who authored this document.

21 And this figure here, you can't see it because it
22 is covered up, but it's from the cover page of the document.
23 And you see that there's a sample parameter set shown in a
24 box below that the decoder has stored in one of its bins
25 where it is storing parameter sets.

1 And the idea -- well, first of all, it teaches
2 the notion of parameter sets. And we will get into that.
3 And the idea is that now parameter sets can be parameters
4 that can be sent on a separate stream. I have highlighted
5 that, and don't have to be mixed in as headers were in
6 previous standards into the stream of the compressed data
7 itself. You can pull the parameters out instead of headers,
8 you can now send them separately along this separate
9 streaming table that I've shown in yellow.

10 Q. Were Dr. Wenger or Mr. Stockhammer affiliated
11 with Nokia?

12 A. No.

13 Q. Let's turn to slide 67.

14 What kind of parameter set structure did VCEG-N52
15 propose?

16 A. So it's important just to pause here for a
17 second. When I look at this -- when I look at this
18 document, this is the page I would go to. This is a single
19 page. It's in the document. And it is like it's all here.
20 It's almost like it could be a presentation slide at this
21 trial. I guess it sort of is. It's on the screen.

22 And you see the introduction talking about four
23 different syntax levels. And now you see in bold face
24 clearly laid out a hierarchy of parameter sets, right, four
25 parameter in a hierarchical relationship. So the whole idea

1 of parameter sets of a hierarchy, of -- of -- it's there.
2 And, in fact, if you wanted to buy them up it's sort of
3 really clear, you could just put lines where the boldface
4 titles are, right?

5 So it's a very clear -- not only is a good
6 document but the document itself happens to have a great
7 explanation where you can look at this page and really see
8 sort of the full picture of what's being proposed.

9 Q. Did VCEG-N52's parameter set concept provide any
10 benefits?

11 A. Yes. So it is beneficial for error resiliency.
12 So now parameters instead of being mixed into the data
13 stream and possibly corrupted with the normal kind of
14 corruptions can be sent separately, maybe more securely, and
15 retained over time but also at the time there was also
16 considered a benefit in efficiency, if you will, where
17 parameters that occurred -- were parameters that occurred
18 often now could be sent once, okay. So there is an
19 efficiency advantage as well. Yeah.

20 Q. Let's turn to slide 68. Can you describe what
21 Nokia proposed in JVT-C078?

22 A. Sure. This now is a figure from JVT-078. What
23 you see are a description of four parameter sets in a
24 hierarchy. You have slice parameter sets and slice
25 parameter sets can point upward to picture parameter sets.

1 And here picture parameter sets can point up to
2 the highest level, having two different things at the
3 highest level. You can have presentation parameter sets and
4 you can have independent GOP parameter sets. And
5 independent GOP is a term we will often see, used
6 interchangeably with sequence.

7 So, in any case, the two different kinds of
8 parameter sets at the highest level, but a total of four in
9 this particular structure.

10 Q. Was Nokia aware of VCEG-N52 before they wrote
11 C078?

12 A. Yes. Yes. They were. Yes.

13 Q. How does the parameter set structure in C078
14 compare to what's in VCEG-N52?

15 A. So it's pretty much, if you remember that one
16 page I said to remember, it's pretty much take that page and
17 divide into parameter sets according to the boldface
18 heading. Pretty much identical to that.

19 Q. Just to be clear, how many parameter sets were
20 proposed in JVT-C078?

21 A. Four.

22 Q. Were the four parameter sets proposed in a
23 specific arrangement?

24 A. Yes. And so the specific arrangement, and we
25 will talk more about the rules that kind of constrain this

1 arrangement, was a very particular arrangement that reflects
2 the document that they were referring to, which is VCEG-N52.

3 Q. Does C078 propose using anything other than four
4 parameter sets?

5 A. No.

6 Q. Are you aware of any differences between C078 and
7 some of the drafts of C078 that Dr. Kia testified about?

8 A. No. No differences that matter for this case.

9 Q. Let's turn to slide 69.

10 Did the JVT adopt C078?

11 A. They did not.

12 Q. Why do you say that?

13 A. I have shown some quotes here that are very
14 useful. Let me read the first one. The group decided to
15 have only the independent GOP parameter set. Some of the
16 proposed parameters were considered potentially unnecessary.
17 Okay.

18 Now, if we move down, resolution, the group
19 stripped off the list of proposed parameters and at the end
20 only the independent GOP parameter set remained. So just
21 the one parameter set.

22 But then it goes on to say, which I have in
23 orange, "however, it was later noticed that a picture
24 parameter set might become handy at some point." And the
25 modified proposal was adopted to include the second

1 parameter set. However, that wasn't -- that suggestion
2 wasn't by Nokia.

3 Q. Turning to slide 70, was it Dr. Hannuksela who
4 later noticed that a picture parameter set might become
5 handy at some point?

6 A. No. So on this slide, an excerpt from his
7 deposition, the question:

8 "Question: Who later noticed that a picture
9 parameter set might become handy at some point?

10 "Answer: Somebody else than me. I think
11 somebody else than me made that conclusion."

12 Q. Let's turn to slide 71.

13 Where did the development of parameter sets go
14 from there?

15 A. So, you will recall Gary Sullivan, head of the
16 standard and major figure throughout the standards and also
17 a person we saw for one of the authors in that summary paper
18 earlier on as well, and he goes ahead and he proposes, yeah,
19 I think we should have two parameter sets.

20 Q. What are the parameter sets that Dr. Sullivan
21 proposes?

22 A. The two, we can see excerpted a quote here. I
23 think there should be a distinction between global
24 sequence-level parameter sets and lower-level dynamic
25 parameter sets."

1 Sequence-level parameter set data would be all
2 the things that prohibit ever changing, and the lower-level
3 dynamic parameters data set should be all the things that
4 might. Okay. So he's proposing two levels of parameter
5 sets.

6 Q. Is the higher-level parameter set like the
7 sequence parameter set in the claims?

8 A. So the higher-level parameter set would be like
9 the sequence level, yes.

10 Q. Is the lower-level parameter set like the picture
11 parameter set in the claims?

12 A. It's like that, yes.

13 Q. What else did Dr. Sullivan propose in his e-mail?

14 A. He also proposed that you should have a picture
15 ID in the slice header.

16 Q. Let's turn to slide 72.

17 Where did the development of parameter sets go
18 from there?

19 A. Okay. So we mentioned this. This is now Sony
20 coming along and JVT-D087. Let me read the excerpt and
21 explain it a little bit too. The parameter is split into
22 sequence parameter, (i.e., static parameters) and slice
23 parameter set (dynamic parameters). The sequence level
24 parameter contains parameter settings that are constant for
25 each frame in a group of pictures and can only change a

1 group of pictures' boundaries. Slice parameters, on the
2 other hand, contain information that changes at the slice or
3 picture level."

4 And here I should explain, if you actually read
5 the document, this really is just picture parameters. It
6 satisfies what is the picture parameter set, and it's just
7 that they use that naming here, but when you read the
8 document, you see that it occurs at boundaries of pictures.

9 So they are proposing two parameter sets. And
10 they also, when you read the document, proposed a
11 hierarchical arrangement between those two parameter sets.

12 Q. What do you mean by a hierarchical arrangement?

13 A. That the picture parameter set will point up to
14 the sequence parameter set.

15 Q. Let's turn to slide 73.

16 After C078, did Nokia have a second parameter set
17 proposal?

18 A. Yes. I mentioned this earlier. Remember that
19 was one of the other sort of what I call dead ends in the
20 timeline. And let me just read the two things that are
21 highlighted. "We propose that infrequently changing
22 parameters are collected into the parameter set similarly to
23 JVT-CD. The referred parameter set and its values must
24 remain the same within one independent GOP, group of
25 pictures.

1 "Parameters that are allowed to change on a
2 picture basis but which remain the same throughout all
3 slices of the picture are generally collected into the
4 picture parameter structure."

5 This proposal, when you read further is going to
6 propose something different than a hierarchy, though.

7 Q. Does this proposal represent a change in Nokia's
8 thinking from C078?

9 A. Yeah, in a way. I mean, basically when C078 is
10 four and there's a hierarchy involved. Here it's two, and
11 we will see there is no hierarchy involved.

12 So it seems to be, again, maybe them struggling
13 with ideas that weren't -- as you saw from the timeline,
14 they weren't adopted. This one wasn't either.

15 Q. Turning to slide 74, does D094 explain why there
16 was a change in structure from C078?

17 A. Yeah. But I have highlighted two sentences. Let
18 me, before addressing that, read the first sentence, which
19 kind of follows what I was saying in the previous slide.
20 "The slice header as proposed in this document contains an
21 identifier of both the picture parameter set and the picture
22 -- both the parameter set and the picture parameter set."

23 So what it is saying here is instead of having a
24 slice header point to the picture and the picture pointing
25 to the sequence, which is what came -- what Sony did, it is

1 not instead but it's different than that, right?

2 Here what they are doing is having two pointers
3 in the slice header, just pointing upward to those things.
4 There is not the hierarchy. There is not one pointing to
5 the other. So it's a different mechanism. It wasn't
6 accepted, not like Sony and Sullivan.

7 And then it goes on to say, sort of to address
8 your question more specifically, "it is possible to get rid
9 of the other identifier by nesting the identifiers as
10 proposed in JVT-078. However, the bit-rate saving was
11 considered as negligible." So it's kind of saying, yeah,
12 they are kind of abandoning C078 although they are
13 abandoning it for something else that wasn't adopted either.

14 Q. Turning to slide 75, based on these proposals,
15 what happened next at the JVT?

16 A. So the committee considered proposals, including
17 Sony, including Nokia, and considered several proposals to
18 decide which one to adopt.

19 Q. Turn to slide 76. What was ultimately adopted by
20 the JVT?

21 A. So this is important. Again, now we're
22 looking -- again, this is the deposition of Mr. Wenger.
23 Again, the inventor of the parameter set concept in
24 VCEG-N52. Let me just go through it quickly.

25 Under the summary, if you scroll down,

1 "Mr. Walker" -- he is now referring to the inventors for the
2 Sony proposal -- "split parameters into sequence parameters,
3 static parameters, and slice parameter set, dynamic
4 parameters.

5 "Answer: Yep.

6 "Question: And do you know if at least some of
7 this proposal in this document made it into the H.264
8 standard?"

9 So this is clearly the key part.

10 "Answer: So the output of the Klagenfurt meeting
11 included a thing called sequence parameter set and picture
12 parameter set. The picture parameter set is roughly
13 equivalent to what is called a slice parameter set -- that's
14 in the Sony proposal."

15 Remember, I mentioned they used a different name
16 but the same thing and the sequence parameter set is roughly
17 equal to what they call the -- that is exactly a typo, it
18 should be GOP parameter set or something like that. Yeah.

19 "So this made it --

20 "Answer: Yes.

21 "Question: The H.264.

22 "Answer: Yes. This was -- this was accepted,
23 yes."

24 Q. Let's turn to slide 77. What happened next?

25 A. So now that Sony proposal basically through this

1 thought process, we went from VCEG-N52 to Sullivan to Sony
2 to JVT-145 where it made it into the standard. And now you
3 see the syntax for the hierarchical arrangement of the two
4 parameter sets. There is the slice header that points up to
5 the picture parameter set and the picture parameter set
6 points up to the sequence parameter set.

7 Q. Turning to slide 78, I want to turn your opinions
8 on conception. Let's first discuss the asserted claims.

9 Which independent claims are asserted by Nokia?

10 A. Two decoding claims, claim 6 and claim 15.

11 Q. Is there overlap in these claims?

12 A. They are basically the same for our purposes. I
13 have highlighted all the stuff that's the same. And really
14 it is, again, just some language between them, the
15 differences. It is distinguishing method claim from an
16 apparatus claim.

17 Q. Is there a difference in the claims that would
18 impact your opinions on non-infringement or invalidity?

19 A. No.

20 Q. Let's look at slide 79. Is it your opinion that
21 Nokia is entitled to an April 27th or May 1st conception
22 date?

23 A. They are not.

24 Q. Why do you say that?

25 A. Okay. So what I have done here is I have

1 annotated what I call the rules for -- that were presented
2 in C078 for what constitutes the four parameter sets that
3 are proposed. Okay?

4 So for slice parameter set, parameters can change
5 between slices. For pictures parameter set, pictures can
6 change between pictures. Parameters can change between
7 pictures. Sorry about that.

8 And now over on the right we have two different
9 parameter sets at the highest level. We have
10 display-related parameters called presentation parameters
11 and parameters can change between independent GOPs. That's
12 like sequence parameters. So there is two -- there is this
13 relationship of working to two different parameter sets at
14 the highest level.

15 So those are the rules that were used to define
16 this structure that displays these four parameter sets.

17 Q. Is this same figure included in the specification
18 of the '818 patent?

19 A. It is.

20 Q. Does that change your opinion about whether C078
21 supports conception of the claims in the '818 patent?

22 A. Not at all. So if you actually -- so if you look
23 at the specifications of the '818 patent, it has this
24 figure, C078, and it describes in reference to this figure
25 these rules. But then, remember now, that the '818 patent

1 was filed after the issuance of the standard.

2 Then there is also new material in the '818
3 patent that describes a different set of rules. And it's
4 that different set of rules that's used for issuing the
5 claims. And so the inventors of the '818 patent, the named
6 inventors, did not have in their -- did not have in their
7 possession those new rules back in C078. Putting the figure
8 in the patent doesn't change that. Okay?

9 And, in fact, the claims of the '818, which are
10 using new material and new rules, they don't read on this
11 figure, okay? So a different set of rules, different set of
12 rules used for C078, new material and different rules used
13 referring to the claims in the '818 patent.

14 Q. Based on what you just said, Dr. Storer, is this
15 an issue of four parameter sets versus two?

16 A. Definitely not. It's not a matter of, you know,
17 four marbles versus two marbles or something. You're
18 talking different sets of rules for a structure. C078 has a
19 structure of parameter sets. It not only has two parameter
20 sets that aren't present in the claims, we see, but it is
21 also a different structure, for example, two sets at the
22 highest level here in our hierarchical arrangement.

23 And so it's a different set of rules, a different
24 structure, and the named inventors did not have in their
25 possession what is the claims -- what is claimed in the '818

1 patent, they are based on new material and new rules that
2 was presented to the examiner in the prosecution.

3 Q. Let's turn to slide 8.

4 Now, what rules are proposed in the '818 patent
5 versus C078 about slice parameters?

6 A. Okay. Let's start there. So what I have done is
7 I have shown on the left the '818, the right, C078. On the
8 left, let's talk about -- let's see the highlighted text.
9 Parameters whose value may change in every slice or whose
10 value is likely to change in every picture are included in
11 the slice header.

12 Over on the right, I have actually shown a new
13 parameter set that isn't present, right, in H.265 or the
14 claims. And it says the selected parameters for the slice
15 parameter set were such. Okay. So on the left, it is slice
16 header. On the right, it's slice parameter set. It's a
17 parameter set that is no longer around when we get to H.265
18 or the claims of the '818.

19 Q. Is a header the same as a parameter set?

20 A. No. A header is this particular value, a
21 particular entity that's not the same as a parameter set.

22 Q. And are the rules on the left-hand side the same
23 as what the applicant gave to the USPTO during prosecution
24 of the '818 patent?

25 A. Yes.

1 Q. So in your opinion, had the named inventors
2 conceived of the claimed slice header by April or May of
3 2002?

4 A. No.

5 Q. Let's turn to slide 81.

6 What are the rules in the '818 patent versus C078
7 for sequence parameters?

8 A. So this is worth looking at because it is quite
9 explicit here. So on the left, the '818 patent says "such
10 parameters which are not allowed to change in a coded video
11 sequence are included in the sequence parameter set." So
12 sequence parameter set is this one thing, has all the things
13 that don't change. Okay? That's '818. That's the new
14 rules.

15 What about C078? C078 has two parameter sets at
16 that level of things that don't change. It has presentation
17 parameters, they don't change, but they are in a
18 presentation parameter set. They are separate from group of
19 picture, which is like sequence parameters, right?

20 So in JVT-078 they are not bundled together into
21 one parameter set. This is a different structure, it's
22 different rules. If JVT-078 was using the '818 rule, that
23 would be one parameter set. Okay? So the '818 is using the
24 new rules based on the new material in the '818 patent.

25 Q. Did you hear any testimony from the inventors on

1 whether the sequence parameter set in the claims can include
2 presentation parameters?

3 A. I have.

4 Q. What did that testimony say to you?

5 A. They are saying it can.

6 Q. Let's turn to slide 82. What are you showing
7 here?

8 A. So I'm showing in H.264, yeah, they are in there,
9 but in C078, no. They are in their own separate parameter
10 set.

11 Q. Dr. Storer, you have highlighted two different
12 bundles of four parameters. Can you explain why you did
13 that?

14 A. Well, they are both -- they are both presentation
15 parameters, just different names, but these presentation
16 parameters are just bundled together, as with the new rules,
17 as with the different rules for the issuance of the '818
18 claims in JVT-078, presentation parameters using a different
19 set of rules are in a separate parameter set in that
20 different structure.

21 Q. So in your opinion, had the named inventors
22 conceived of the claimed sequence parameter set by April
23 27th or May 2nd, 2002?

24 A. No.

25 Q. Let's turn to slide 83.

1 Do you recall testimony from Dr. Kia that
2 JVT-C078 discloses an example of two parameter sets?

3 A. I do. I was here when he gave that testimony.

4 Q. Do you agree with his testimony?

5 A. No. He mischaracterized an example that is
6 completely consistent with the rest of the document.

7 Q. And if we advance the slide, what are you showing
8 here, Dr. Storer?

9 A. I'm showing that if you look at the whole
10 document, if you look at the whole example, not just a piece
11 of it, in fact, you can see more of it here but you can
12 clearly see there are four parameter sets.

13 And if you want to highlight things, you can see
14 all the relationships. There is even another one of the
15 sequence parameter sets shown on the next page.

16 The example is completely consistent with the
17 document as a whole. JVT-078 has a set of rules that
18 describes four parameter sets in a particular structure,
19 including at that highest level, parameter sets that are
20 like this. They are not the same. You know?

21 And so there is nothing -- somehow the
22 implication that, oh, it talks about four but it also points
23 out two or something is completely misleading. Maybe not
24 intentionally. I am not trying to criticize in that sense.
25 I am just saying it is a completely consistent document

1 throughout. The example is completely consistent with the
2 document as a whole.

3 Q. Let's turn to slide 84.

4 If Nokia can't show conception in April or May of
5 2002, is there a piece of prior art that you think
6 invalidates the claims?

7 A. Yes. So, remember, the claims of the '818 were
8 issued after the standard was -- I'm sorry. The '818 was
9 filed after the standard was issued, right? So if we look
10 at a document for the standard, it is going to -- it is
11 going to make it obvious.

12 This is referring to an issuance of the standard.

13 Q. If we turn to slide 85, what is shown here,
14 Dr. Storer?

15 A. So this is the header for that document, again,
16 an issuance, an actual issuance of the H.265 standard.

17 Q. When was this document generated?

18 A. You can see the date in the upper right.
19 September 19th, 2002.

20 Q. Was this document available to the public before
21 the application for the '818 patent?

22 A. Yes, it was.

23 Q. Did you review any documents showing that?

24 A. Yes. I have seen e-mails from them broadcasted
25 to the whole group about this. I've seen other documents as

1 well. And in my mind there's no question that this was
2 publicly available at that time.

3 Q. Let's turn to slide 86.

4 What is your opinion on whether the JVT-E022d7
5 reference renders obvious all asserted claims of the '818
6 patent?

7 A. Well, this slide is a straightforward thing. It
8 is an issuance of the standard. And I show that the claim
9 elements and also the independent claims on the left, you
10 can just see citations to the standard.

11 Q. Does Nokia dispute that this reference meets all
12 the claims, all the limitations of the asserted claims in
13 the '818 patent?

14 A. No, they don't.

15 Q. Let's turn to slide 87 and turn to your opinion
16 on VCEG-N52 plus Sriram. If you look at slide 88, what's
17 shown here?

18 A. Here I've shown the title pages from both
19 documents; on the left the VCEG-N52, and on the right the
20 Sriram patent.

21 Q. Looking at slide 89, can you remind us what
22 VCEG-N52 discloses?

23 A. Sure. I am happy to. For me when I look, as I
24 mentioned earlier, when I look at VCEG-N52, this is what I
25 look at. It's a terrific presentation. It is all there.

1 Right? You have got the four different levels mentioned in
2 the introduction and you have got the four levels, that it's
3 proposing four levels, it's proposing a hierarchical
4 relationship.

5 You have got the nice headings separating them.
6 And you sort of see it all laid out here in this document.

7 Q. Let's look at slide 90. What does the '818
8 patent say about VCEG-N52?

9 A. So before I read the two excerpts, I just want to
10 note that we see that VCEG-N55 in the middle of the first
11 highlighted portion. That's just a typo. Both parties
12 agree that that's a typo and it should be N52.

13 With that understanding, let me just read the
14 quote. Again, this is from the '818 specifications. "A
15 concept of a parameter set, introduced in ITU-T document
16 VCEG-N52 replaces such headers. An instance of a parameter
17 set includes all picture, GOP, and sequence level data."

18 If we go down now, another one I have pointed out
19 here, "parameter sets decouple the transmission and decoding
20 order of infrequently changing picture, GOP, and sequence
21 level data from sequence, GOP, and picture boundaries."

22 Q. Turning to slide 91, what does Sriram teach.

23 A. So this is a paragraph excerpt from Sriram. And
24 I have highlighted it because it is useful to read these
25 sentences one at a time. They kind of build.

1 First, there are several parameters which were
2 extracted from the picture, sequence, and GOP headers which
3 are needed for processing an individual macroblock. Several
4 smaller data structures are defined and a pointer to these
5 data structures is included in the slice and macroblock data
6 structures.

7 So now you have this idea of hierarchical
8 arrangement of having one set pointing up to a higher level.
9 "For example, parameters like picture horizontal slice and
10 so on are extracted from picture headers and extensively
11 used for macroblock processing (motion compensation).
12 Instead of having a copy of this parameter in every slice
13 and macroblock structure, parameters like horizontal and
14 vertical size are grouped together into another data
15 structure (for example, picParameters) and a pointer to this
16 structure is implemented in every slice."

17 So here you have this notion of breaking up of
18 parameter sets. We saw VCEG-N52 laid it on all out but it
19 didn't expressly say break it up. It is really obvious how
20 to do it, but it didn't expressly say it. Now you can get
21 support of this combination that describes this notion of
22 having a smaller level pointing to a higher level.

23 Q. Turning to slide 92, do Sriram's teachings of
24 smaller data structures provide any benefits?

25 A. Yeah. Similar to what saw in VCEG-N52, it says

1 one design goal is efficiency. It's important to
2 efficiently process shared parameters. So there is a common
3 design goal. It is very natural to combine Sriram with
4 VCEG-N52.

5 And this is one of the -- support for that, that
6 common goal.

7 Q. Turning to slide 93, we can start walking through
8 the elements, Dr. Storer.

9 What is your opinion of whether VCEG-N52 plus
10 Sriram discloses the preamble of claim 6 and 15?

11 A. Sure. So on the left I have shown the preamble
12 again. Okay? A method for decoding sequences of pictures
13 from a bitstream wherein parameters are defined in a
14 parameter set. And each picture comprises information of
15 one or more slices, the method comprising, right.

16 And over here, this is -- I couldn't fit the
17 whole page here but this is the start of that key page I say
18 when I go to look at the document, I look at this page where
19 it lays out the four levels, it is a page describing
20 parameter sets and then it goes on to sequence parameters
21 and continues onward downward in that document.

22 So this to me clearly shows the preamble.

23 Q. Does VCEG-N52 and Sriram describe the use of a
24 processor?

25 A. Sure. Yes.

1 Q. If we look at slide 94, what is your opinion on
2 whether VCEG-N52 plus Sriram satisfies element A?

3 A. So, again, let's first stick with our pattern
4 here and read the claim element. Recognizing in a decoder a
5 sequence parameter set and forming at least one sequence
6 parameter pertaining to a sequence using the parameter set.
7 Now let's take a look. This is now the block diagram that
8 was on the first figure in VCEG-N52.

9 And what I have done here is to give an
10 animation. If you want to go ahead and play it, I can talk
11 about what happens.

12 Q. What does this animation show, Dr. Storer?

13 A. So let's go forward. Let's just watch it for a
14 second. What we saw was we started with a parameter set, a
15 group of picture parameter set, let's say, in this example.
16 And let's suppose it was one of the parameter sets that the
17 decoder had stored in its memory for parameter sets, let's
18 say Number 3.

19 And now going across from left to right you see
20 the idea of the invention that instead of sending the
21 parameter set intermixed with the associated video, it is
22 sending the parameter set along the bottom and the video
23 associated with it along the top in separate channels. And
24 now you see the parameter set arriving at the decoder, the
25 decoder receives it, parses it, whatever, and it's

1 recognized at that point.

2 Q. Then how does VCEG-N52 and Sriram satisfy the
3 forming element?

4 A. So we can continue with the video. And now we
5 see, okay, here is this -- this parameter set came across,
6 again, and as the VCEG-N52 teaches, not in a header, but it
7 comes ahead in a parameter set next to, if you will, the
8 associated -- the video that it's associated with.

9 And now the decoder says: Oh, okay, I'm going to
10 say save that and put it in bin 3 and that's being formed.

11 Q. Let's turn to slide 95. How does your opinions
12 that VCEG-N52 and Sriram satisfy element B?

13 A. So again, element B very similar to what we just
14 did, very similar kind of claim element, recognizing in the
15 decoder a picture parameter set and forming at least one
16 picture parameter value pertaining to a picture using the
17 parameter set.

18 So I will go ahead and do the same. We're going
19 to do the same thing we did previously, but we will do it in
20 green.

21 So same process. The idea of VCEG-N52 is you can
22 separate, you can send the parameter set in a separate
23 channel that is from the associated video and now it arrives
24 at the decoder. The decoder parses it. And it has
25 recognized it.

1 Q. How does VCEG-N52 and Sriram disclose the forming
2 limitation?

3 A. So, again, it -- now, the decoder says, okay, I
4 have recognized this parameter set, it has come over a
5 separate link from the video that it's associated with, and
6 I am going to take it and store it in one of my bins that
7 I'm remembering parameter sets in.

8 Q. How does VCEG-N52 and Sriram disclose the
9 pertaining to the picture using the parameter set?

10 A. So we just saw that, actually, in the
11 demonstration here because you're seeing how both -- both
12 things come across, right? It is the new idea is that I can
13 actually send the parameter sets not in headers, but
14 separately. But, of course, you're still sending the video,
15 the associated video.

16 And so the parameter sets are definitely
17 pertaining to the associated video that is being sent
18 across.

19 Q. Let's turn to slide 96.

20 In your opinion, does VCEG-N52 and Sriram satisfy
21 element C and D?

22 A. Yeah. It is a little bit long to read, but I
23 think just to stick with the way that I have been forming
24 these slides, let me read the claim elements. Okay?

25 Element C is forming in the decoder, at least one

1 second picture parameter value using information of a slice
2 header, the at least one second picture parameter Valerie
3 make unchanged at least in all slice headers of one picture
4 and then, D has using in the decoder the at least one second
5 picture parameter value in decoding.

6 So over on the right here I have shown some
7 excerpts, okay, and you see up in VCEG-N52 picture ID, in
8 Sriram, PicFrame, okay, and relative to element C, you also
9 see in Sriram the idea that it is needed for MPEG decoding.
10 So it is being used, right?

11 So the combination satisfies this claim element.

12 Q. Would picture ID remain unchanged in all slice
13 headers of one picture?

14 A. Yes, of course.

15 Q. Why do you say that?

16 A. So, again, pictures are formed from a bunch of
17 slices. It could be one but generally a bunch of slices.
18 And if your slices are all part of the same picture, then
19 clearly you want to all have the same picture that you're
20 identifying yourself as being part of.

21 Q. Would PicFrame remain unchanged in all slice
22 headers of one picture?

23 A. Yes.

24 Q. Why do you say that?

25 A. Same reason. Same logic.

1 JUDGE ELLIOT: Mr. Klein, I would like to take
2 our lunch break sometime soon.

3 MR. KLEIN: Now is great, Your Honor.

4 JUDGE ELLIOT: Very well. I have 12:16. Let's
5 come back at 1:30, 1:30.

6 And sir, during our break, please don't discuss
7 your testimony.

8 (Whereupon, at 12:16 p.m., a lunch recess was
9 taken.)

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 A F T E R N O O N S E S S I O N

2 (1:30 p.m.)

3 JUDGE ELLIOT: Have a seat.

4 Mr. Klein.

5 MR. KLEIN: Thank you, Your Honor.

6 BY MR. KLEIN:

7 Q. Dr. Storer, before the lunch break, we were
8 talking about the combination of VCEG-N52 and Sriram, and we
9 were primarily discussing claim 6.

10 Are your opinions the same for claim 15?

11 A. The answer is yes.

12 Q. Does VCEG-N52 combine with Sriram disclose a
13 receiving device with the decoder?

14 A. Yes.

15 Q. Why do you say that?

16 A. You can see that -- in fact, we discussed that
17 earlier, in the primary figure. There is a receiver.

18 Q. Let's turn to slide 97.

19 Does VCEG-N52 combined with Sriram disclose claim
20 8?

21 A. So let's -- excuse me. Let me take a drink here.

22 So let's go ahead as before and first read the
23 claim element. "Wherein the picture parameter set is
24 included with a reference to a sequence parameter set."

25 So, again, you can look to Sriram, and here's a

1 sample, talking about this idea.

2 In addition, there are several parameters which
3 were extracted from the picture sequence and GOP headers
4 which are needed for processing an individual macroblock.
5 Several smaller data structures are defined, and a pointer
6 to these data structures is included in the slice and
7 macroblock data structures.

8 So the idea of a smaller one pointing to a larger
9 one, this is something that's very natural, something that
10 -- natural to combine with Sriram. And so, yes.

11 Q. Dr. Storer, why would a person of ordinary skill
12 in the art combine this particular disclosure with VCEG-N52?

13 A. We saw earlier that the two disclosures have
14 common goals. They, of course, obviously address subject
15 matter, similar subject matter. They have common goals of
16 efficiency and so on, where the smaller -- both of them have
17 talked about the smaller data structure and -- the smaller
18 one and the larger one and you don't have to send the larger
19 one as frequently.

20 So efficiency would be another motivation, for
21 example.

22 Q. Turn to slide 98.

23 In your opinion, does VCEG-N52 combined with
24 Sriram render claim 9 obvious?

25 A. So let's read the claim. "Wherein the second

1 picture parameter value is selected from a group of
2 information of a picture order count and a frame number."

3 So one of those two things. And this excerpt I
4 have from Sriram certainly qualifies. The PicFrame
5 structure defines the starting address of all the frames
6 that are needed for MPEG-2 decoding.

7 Q. So how does this disclosure here map to claim 9?

8 A. So this shows that you actually have a parameter
9 which -- wherein said picture parameter value is selected
10 from a group of information. So it's -- that would satisfy
11 the identifying a frame, the PicFrame, like frame_number.

12 Q. Turn to slide 99 and let's talk about secondary
13 considerations.

14 Did you see any evidence that, in your opinion,
15 demonstrates the asserted claims were not obvious?

16 A. No, I didn't. And I've summarized here lack of
17 evidence -- for example, commercial success, user manuals
18 for third-party products. I mentioned things like that. I
19 haven't seen that. There has been -- I haven't seen
20 anything in this case. Long-felt, unmet needs, I haven't
21 seen any evidence showing there was some need for a nexus
22 between any of the long-felt need and the claimed invention.

23 Now, praise by others, I mean, we have seen
24 praise for parameter sets, like what was proposed in
25 VCEG-N52. So parameter sets have had praise, but as far as

1 the claimed invention and some incremental improvement or
2 something in the claimed invention, I haven't seen praise by
3 others of the -- of the '818 patent. Copying, no evidence
4 of that.

5 And also it's worth mentioning, we talked about
6 this earlier, JVT's rejection of C078 four-parameter set
7 structure. And, you know, incorporates -- it wasn't
8 incorporated into the standard.

9 Q. Let's turn to slide 100, Dr. Storer, and talk
10 about whether the claims use well-known technology. Look at
11 slide 101.

12 Are you aware that Nokia alleges there are
13 certain inventive concepts in the claims of the '818 patent?

14 A. I am.

15 Q. What is your understanding of what those alleged
16 inventive concepts are?

17 A. This is a very simple slide. It's summarizing
18 what I can see, is just two, the idea of smaller data
19 structures, breaking things up in a specific category.

20 Q. Let's turn to slide 102. Does anything in the
21 claims -- and we see claim 6 on the left -- pertain to a
22 novel data structure?

23 A. So let's read it, by the way the excerpt here
24 from the patent. "Another inventive concept of the present
25 invention splits the parameter set structure to multiple

1 parameter set structures according to the persistency and
2 target of parameters."

3 So this idea of dividing a bigger structure into
4 smaller structures is a -- you know, it's a data structure
5 thing that goes back to the beginning of data structures and
6 programming. You saw at the beginning, I have written a
7 book on data structures. And the reason I wrote the book is
8 I had course notes from a course I taught on that years ago.
9 And the course notes are teaching material that was known
10 for years before that.

11 So data structures are well known. The idea that
12 you can split something up into pieces is just a natural
13 well-known thing with data structures.

14 Q. Was the parameter set structure known before the
15 '818 patent?

16 A. Sure, of course. Yes. So parameter sets, we've
17 talked about that quite a bit prior to '818. Parameter sets
18 were known. We saw them introduced in VCEG-N52.

19 Q. Turn to slide 103. Did you discuss any
20 references today that disclose using smaller data
21 structures?

22 A. Yes.

23 Q. Which references did you discuss?

24 A. So we looked at, for example, combining Sriram
25 with VCEG-N52, and we saw a number of quotes, but here's an

1 example, several smaller data structures are defined and a
2 pointer to these data structures is included in the slice
3 and macroblock structures. So, again, this notion, smaller
4 one to a bigger one, you know, very well known.

5 Q. Let's turn to slide 104, Dr. Storer.

6 What is your opinion on whether the specific data
7 category claimed in the '818 patent was well known?

8 A. It was well known. I've given some examples up
9 top. I mean, first of all, I've already talked about
10 VCEG-N52. But you can go to earlier standards, going back
11 to February of 1998, H.263. And here I'll take a quote from
12 the standard. "GFID shall have the same value in every GOB
13 (or slice)header of a given picture."

14 So this notion is even in earlier standards from
15 years -- from beforehand and also other places I've pointed
16 to here.

17 Q. Dr. Storer, you mentioned this notion was known.
18 What did you mean by that?

19 A. So the idea of -- in fact, I should have used the
20 usual format where first I read the claims. I apologize.
21 "At least one second picture parameter value using
22 information of a slice header, at the at least one second
23 picture parameter value remaining unchanged at least in all
24 slice headers of one picture."

25 So this idea of a simple, constant parameter was

1 known, for example, in the earlier standards.

2 Q. Do the claims require any particular kind of
3 recognizing, forming, or using of parameters or parameter
4 sets?

5 A. No.

6 Q. Is there anything special about the processor
7 recited in the asserted claims?

8 A. No.

9 Q. Is there anything special about the computer code
10 recited in the asserted claims?

11 A. No.

12 Q. Is there anything special about the memory
13 recited in the asserted claims?

14 A. No.

15 Q. Is there anything special about the decoder
16 recited in the asserted claims?

17 A. No.

18 Q. Is there anything about the order or combination
19 of steps in the claims that provides some inventive concept?

20 A. No.

21 Q. And is there anything in the asserted claims that
22 you believe is an improvement to computer technology?

23 A. No.

24 Q. Why do you say that?

25 A. I just don't see -- the claims are very

1 incremental. I'm not disputing that VCEG-N52 parameter sets
2 were something significant, but the claims are incremental
3 or incremental in nature, and I don't see it as an
4 improvement to the technology.

5 Q. Let's turn to your opinions on non-infringement,
6 Dr. Storer. We'll turn to slide 106.

7 What is your understanding of the highlighted
8 claim language?

9 A. So I've shown the same language in both the
10 method and apparatus. Let's look at method claim 6. And so
11 what I've highlighted in yellow in the first one, you see
12 forming at least one sequence parameter, and in the lower
13 one, you see forming at least one picture parameter.

14 And both of them have a similar clause that I've
15 underlined in red, a second item. So on the first one,
16 "pertaining to a sequence using a parameter set"; and the
17 second one "pertaining to a picture using a parameter set."

18 Q. Were --

19 A. If you want to -- should I keep going?

20 Q. Let me ask you another question.

21 A. Okay. Okay, all right.

22 Q. Were you here when Dr. Kia testified about his
23 opinion on whether the accused products met the forming
24 limitations?

25 A. I was.

1 Q. Did Dr. Kia show that decoders in the accused
2 products form a sequence parameter pertaining to a sequence
3 using the sequence set?

4 A. He did not.

5 Q. And did Dr. Kia show that decoders in the accused
6 products form a picture frame and are pertaining to a
7 picture using the parameter set?

8 A. He did not.

9 Q. Why do you say that?

10 A. So, at best, and not even in all cases, but at
11 best, he pointed to the first part, forming, but did not
12 give evidence of the second part, pertaining. In some
13 cases, not any of the yellow, but in no cases, the parts,
14 the two parts that are underlined in red.

15 Q. Did Dr. Kia cite source code to support his
16 analysis?

17 A. He did cite source code.

18 Q. What did Dr. Kia's source code analysis show?

19 A. But the source code analysis just looks at --
20 just -- the source code analysis doesn't look at -- connect
21 the sequence at hand to the forming. So he just looks at
22 parsing and doesn't look at what it's pertaining to, if it's
23 -- at best.

24 And forming and some kind of storage, at best,
25 but doesn't connect it to what it's pertaining to.

1 Q. And does your opinion apply to Dr. Kia's analysis
2 of all accused products?

3 A. Yes. And as I mentioned, in some cases, it
4 wouldn't even just be the red, but, yes, it applies to all
5 the products.

6 Q. Did you form any other opinions about whether the
7 decoder chips operate in the accused HP products with
8 respect to the asserted claims?

9 A. So in addition -- well, I might want to mention,
10 in addition to sort of lack of evidence in terms of source
11 code, Dr. Kia also shows experiments, but those analyze
12 experiments only show output of the encoder. They don't
13 show anything about what's going on inside the decoder.

14 Q. All right.

15 MR. KLEIN: At this point, Your Honor, we need to
16 go on the third-party confidential record.

17 JUDGE ELLIOT: Very well.

18 (Whereupon, the hearing proceeded in confidential
19 session.)

20

21

22

23

24

25

1 O P E N S E S S I O N

2 CROSS-EXAMINATION

3 BY MR. LIPSCHITZ:

4 Q. Hello, Dr. Storer.

5 A. Hello.

6 Q. Now, it's your opinion that claims 22 and 31 of
7 the '991 patent are not essential to H.265, correct, sir?

8 A. Could you repeat the question?

9 Q. Sure. My understanding is it's your opinion that
10 claims -- the asserted claims of the '991 patent are not
11 essential to H.265. Is that correct?

12 A. So the asserted claims of the '991 patent do not
13 even read on H.265.

14 Q. So it's your opinion they're not essential,
15 right?

16 A. Yes.

17 Q. Yes.

18 A. But they don't -- they don't read on -- the '991
19 patent doesn't even read on it.

20 Q. Right. So if ALJ Elliot disagrees with your
21 non-infringement arguments and finds that the asserted
22 claims are infringed, does that mean that the asserted
23 claims are essential?

24 A. So you're asking for a hypothetical. Let me make
25 sure I understand it. It turns out that it's decided that

Heritage Reporting Corporation
(202) 628-4888

1 the frame -- the claims are valid and infringed?

2 Q. Yes, sir.

3 A. And now you're asking would it be standard
4 essential?

5 Q. Yes, sir.

6 A. I think -- I first would ask to -- there are some
7 different understandings among the community of what it
8 means to be standard essential for an optional feature, but
9 I think it's reasonable to say that most decoders would want
10 to support the SAO functionality for people that wanted to
11 use it. Under this very hypothetical situation, you're
12 saying that somehow the claims of the '991 would actually be
13 valid and infringing, but under that hypothetical situation
14 where we're just taking SAO filter as a concept, I think
15 some people might dispute standard essentiality, but I have
16 no problem agreeing that you'd like to support that feature
17 in the standard.

18 Q. Okay. So that wasn't my question, whether you'd
19 like to support the feature. Okay? So I'd appreciate if
20 you'd answer my question, which is a yes-or-no question.
21 All right?

22 If ALJ Elliot determines that the use of Sample
23 Adaptive Offset in an H.265 decoder infringes the asserted
24 claims and they're valid, are they technically required?

25 A. So is that the same question? Say it again.

1 Q. You said you didn't know what "essential" means.
2 So I'm telling you "essential" means technically required.
3 Okay? So technically required for an H.265 decoder to
4 support Sample Adaptive Offset?

5 A. Okay. I think the answer is more or less the
6 same. There is some disagreement in the community of
7 exactly the definition of standard essential. But I would
8 agree that, in general, a decoder, if -- putting aside the
9 '991 patent being invalid or not reading on it, I would
10 agree that a decoder would want to and likely would support
11 SAO functionality from a technical standpoint, but I would
12 caveat it that there's not a general agreement on the
13 definition of standard essentiality, you proposed one, but
14 in the community.

15 Q. Okay. So you don't know whether it's technically
16 required for an H.265 decoder to support Sample Adaptive
17 Offset; is that right?

18 A. I didn't say that. I think -- I think it's
19 reasonable. I thought it's reasonable that it should
20 support it if it's in the standard. I'm just saying you
21 have to be careful that you wouldn't see that across the
22 literature.

23 Q. Sir, I'd really appreciate if you answer my
24 question, which is not whether it's reasonable, okay? I
25 want to know -- we want to know your view for this case.

1 You understand that whether these claims are essential is a
2 disputed issue in the case, right? You understand that?

3 A. I do understand that.

4 Q. Okay. And you understand that you're arguing
5 non-infringement and Nokia is arguing infringement, right?
6 Do you understand that?

7 A. I have testified to that, yes. Of course.

8 Q. Okay. And so I want to know if the H.265
9 decoders infringe, is the patent essential? Are the claims
10 essential? Will you answer that question?

11 A. So what I said, and I think I did answer your
12 question, it was sort of a yes but with a caution, that
13 there's not a complete agreement on the definition of
14 standard essentiality in the community. But I am more or
15 less saying yes, that I think it's quite reasonable, that I
16 think it's a reasonable thing that, yes, it should be
17 supported and that, yes, for your point of view as a
18 company, it feels like it's essential, but it's a question
19 that technically there is some dispute about that definition
20 according to my experience.

21 Q. Did you identify in your testimony today a single
22 product that supports H.265 decoding but does not support
23 Sample Adaptive Offset?

24 A. No.

25 Q. Okay. All right. Now let's look at the meaning

1 of "prediction error" you've pointed to in the '991 patent.

2 Can I please have CDX-33C.10.

3 So "prediction error, i.e., the difference
4 between the predicted block of pixels and the original block
5 of pixels." Did I read that correctly?

6 A. You did.

7 Q. Okay. Now, the asserted claims for the '991
8 patent in this case are decoder claims, not encoder claims,
9 right?

10 A. That's correct.

11 Q. The claims relate to the coded prediction error
12 signal that is received by the decoder, right, sir?

13 A. That is received by the decoder, yes.

14 Q. Okay. And in the '919 patent, this difference
15 here between the original and the prediction is not sent to
16 the decoder in its entirety, is it, sir?

17 A. I'm not sure what you're asking. Could you
18 clarify a little further?

19 Q. Well, right after this sentence here that was
20 highlighted, the patent says that prediction error is
21 transformed and quantized before it's sent. Right?

22 A. Yes.

23 Q. Okay. So let's focus in on one pixel as an
24 example. All right? So let's say we have a pixel with a
25 value of plus 55. Okay? Now, rather than send the plus 55

1 for that pixel, prior art encoders and decoders could
2 perform prediction, right?

3 A. Well, I think you're framing the question in kind
4 of a funny way. All of the decoders we've talked about or
5 all the encoders we've talked about in the prior art work on
6 a block-by-block basis. So you wouldn't do transform on an
7 individual pixel, for example. Or you wouldn't be -- you
8 would reason about a block of pixels.

9 Q. I understand, but I'm focusing on one pixel as an
10 example so we can understand this. Okay? So you agree with
11 me that rather than send the pixel values, an encoder or a
12 decoder could perform prediction, right?

13 A. So you said picture values in this question. I'm
14 saying it would be a block-by-block basis. And you said --
15 in your hypothetical, you said whether what? Could you
16 repeat that?

17 Q. Sir, rather than send pixel values, an encoder
18 could send motion vectors to a decoder that the decoder
19 could use to perform predictions, correct?

20 A. So that's a different question. And, yes, in the
21 previous standards, when you have a block of pixels, you can
22 send motion vectors to instruct, for example, a copying
23 process to happen at the other end. That may not be all
24 that you send, but you can send those motion vectors, yes.

25 Q. Okay. So the answer to my question was yes?

1 A. It was a little bit longer than that, but I think
2 it was clear.

3 Q. So the answer is yes, correct?

4 A. The answer was a little bit longer than that. I
5 clarified that it was a block of pixels and -- as I
6 understood your question.

7 Q. Okay. Well, in this example, we'll do a
8 prediction. And let's say we -- based on the prediction, we
9 calculate a value for this particular pixel within the block
10 of plus 41. Okay? Do you understand?

11 A. No.

12 Q. Okay. Well, let's just say that we predict a
13 value of plus 41 for one of the pixels in the block. Now,
14 you say the prediction error is the difference between the
15 prediction and the original value, correct, sir?

16 A. So let's first back up, the premise of your
17 question. I've already talked about the fact that you
18 predict block at a time. In fact, you saw in all the
19 diagrams, whether it be the '991 or Koga, there's a
20 difference taken between a block, a predicted block, and an
21 original block. And so you seem to be framing the
22 hypothetical in a way that doesn't really match up what
23 actually happens in either the prior art or the patent.

24 Q. Well, the blocks are made up of pixels, right?

25 A. Blocks -- for example, an original block is made

1 up of pixels.

2 Q. That's right. And the pixels have pixel values,
3 right?

4 A. The pixels have pixel values.

5 Q. And we can use prediction to estimate the pixel
6 values, right, sir?

7 A. The pixel values of a block.

8 Q. Yes, we can use prediction to estimate the pixel
9 values of a block, correct, sir?

10 A. That's a different question. And I would agree
11 that prediction -- well, I don't know as I would
12 characterize this estimating them, but I would agree that in
13 general the idea of prediction for a motion vector gives you
14 a copy block that you would like to use to represent the
15 corresponding pixels. So, in that sense, I would agree with
16 your question.

17 Q. Okay. So you say that the prediction error is
18 the difference between the original value and the predicted
19 value, correct?

20 A. Prediction error is the difference between the
21 original and the predicted, the original block. So your
22 question keeps putting pixel values and -- it's the original
23 block and the predicted block, just to, again, get into the
24 realm of what actually happens in practice and in the past.

25 Q. Okay, sir. The prediction error is the

1 difference between the prediction and the original, correct,
2 sir?

3 A. I'm not sure I understand your question because
4 you've been mixing single pixels and blocks in your
5 questions. Could you clarify?

6 Q. Okay. Well, I'd like to focus on this example,
7 which is one of the pixels in the block. We've performed
8 prediction for this block and we've estimated for this pixel
9 value plus 41. Okay?

10 A. I'm not sure I understand your question.

11 Q. Okay. Well, my question is the difference
12 between the original value and the predicted value here is
13 13. Correct?

14 A. So in your hypothetical, this is -- you're
15 showing a vertical column, not a block. So -- but you're
16 trying to represent the pixel value by a bar graph or
17 something here? Is that what's going on?

18 Q. Yes. The pixel value is represented by this
19 graphic here, sir. And the difference between the original
20 and the predicted value is 13. Correct?

21 A. So, again, you've been mixing pixels and blocks.
22 I would agree here, though. Looking at this diagram, if you
23 subtract 41 from 55 you can compute that difference, but I'm
24 not sure how else to answer your question.

25 Q. Okay. Well, the difference between 55 and 41 is

1 13. And that difference is the prediction error, isn't it,
2 sir?

3 A. So you're saying 55 minus 41 is 13?

4 Q. Yes, sir. And the difference is the prediction
5 error, isn't it, sir?

6 A. Are you sure it's 13? Am I wrong? 55 minus 41.

7 Q. 14, sorry.

8 A. Sorry. I'm not trying to pick hairs. I was
9 trying to make sense of your question.

10 Q. Okay. Okay. So that's the prediction error,
11 right? 55 minus 41, that's 14. That's the prediction error
12 for that pixel, isn't it, sir?

13 A. So, again, you've been framing things in a way
14 that doesn't really correspond to how the '991 patent is
15 written, how Koga is written, how the prior art works. It
16 talks about prediction error being the difference between
17 two blocks, a predicted block and the original block. So
18 the hypothetical doesn't really match up with what I
19 presented.

20 On the other hand, now that we have corrected it,
21 I agree that 55 minus 41 is 14.

22 Q. And that's the prediction error, isn't it, sir?
23 It's the difference between the original and the predicted
24 value?

25 A. It seems to be what you're calling something for

1 an individual pixel. Again, the patents and the previous
2 standards, they work by prediction on blocks. You mentioned
3 motion vectors.

4 Q. Yes, sir. But values are calculated for each of
5 the individual pixels, aren't they, even when they're in
6 blocks?

7 A. Okay. So that's -- so if we talk about a block,
8 and you talk about computing the difference, that -- I have
9 no problem with saying that each value -- to saying yes to
10 your question, that each value is computed by computing a
11 difference on a one-to-one basis where the pixel is in the
12 block.

13 Q. Okay. So each value within the block, the
14 difference value between the original and the predicted
15 value, that's the prediction error, correct, sir?

16 A. But now you're going back and you're talking
17 about individual pixels. We've talked about prediction
18 error as being the difference between an original block and
19 a predicted block.

20 Q. Yes, sir. The difference between an original
21 block and a predicted block. And when you subtract those,
22 you get the prediction error, right?

23 A. So that's a different question. And when you
24 subtract the original -- the original block from the
25 predicted block, I would agree that it gives a prediction

1 error for that, yes.

2 Q. Okay. And the encoder can apply a transform to
3 the prediction error and quantize the transform
4 coefficients, correct?

5 A. So since you have been mixing the terms in your
6 question, could you clarify what you mean by what the
7 transform is being applied to?

8 Q. The block. The encoder can apply a transform to
9 the block of prediction error and quantize the transform
10 coefficients, correct?

11 A. The encoder may employ a transform on the block
12 and then quantize the block, yes.

13 Q. Okay. And when we apply an inverse quantizer and
14 an inverse transform to that same data, we may not end up
15 with the same values as the original, the original
16 prediction error, correct?

17 A. You may not, that's correct.

18 Q. Okay. That's a lossy process, right?

19 A. I would often -- yes, I often call that a lossy
20 process in my writing, yes.

21 Q. Okay. And so when we do that inverse transform
22 and the inverse quantization, we end up with a set of values
23 for the pixels in a block, correct?

24 A. Just to be safe, could you repeat the question?

25 Q. Yes. When we perform the inverse quantization

1 and the inverse transform, we end up with a set of values
2 for the pixels in the block, correct?

3 A. So you end up with a set of values. You have to
4 be careful here, because in this case and in the case of the
5 '991 patent, it's all about sending two things, not just
6 transform and quantization, okay? In fact, transform and
7 quantization is what has been done in the past, okay? It's
8 about sending two things together to give the actual coded
9 prediction error.

10 So you can't just talk about one sort of in a
11 vacuum, if you're referring to something in this case. Now,
12 you've been so far talking about a hypothetical and that's
13 fine, but I just would caution that it wouldn't match up
14 with what we've been talking about in this case.

15 Q. Understood, sir. I'll ask you in a minute about
16 the invention of the '991 patent. Now I'm just asking you
17 that when an encoder applies the inverse transform and the
18 inverse quantization, then we end up with a set of values
19 associated with the pixels in that block. Isn't that true?

20 A. Could you repeat the question?

21 Q. Sir, when you apply an inverse quantization and
22 an inverse transform, you end up with a set of pixel values
23 for the block, correct?

24 A. It seems like a different question. I thought
25 you said encoder in the previous one. So you're saying when

1 you apply inverse -- repeat it one more time.

2 Q. When you apply an inverse quantization and then
3 an inverse transformation, we end up with a set of pixel
4 values for the block. Correct, sir?

5 A. So I wouldn't agree with that in the context of
6 this case. I think if you had a hypothetical or something
7 from another system, where it was only doing transform and
8 quantization and now you did inverse transform and inverse
9 quantization --

10 Q. Well, you agree with me that the accused products
11 do inverse transform and inverse quantization on blocks,
12 don't you?

13 A. Okay. So -- okay. So hold on one second. Let's
14 just -- so could you repeat your question?

15 Q. Sure. You agree that the accused products apply
16 inverse transformations and inverse quantization to blocks
17 of pixels?

18 A. I would agree that that's part of the -- I would
19 agree that H.264 and H.265 do employ inverse transform and
20 inverse quantization, yes.

21 Q. The blocks of pixels and they arrive -- they
22 determine from that process a set of pixel values, correct?

23 A. It's -- it's a set of -- in a context, it is.
24 It's a set of values that are now going to have to be added
25 to the prediction.

1 Q. That's right, sir. So if we perform our inverse
2 quantization and our inverse transform and we add the value
3 to the prediction, that's what I want to do here -- let's
4 say that in this example, for this particular pixel within
5 this block, the value for the inverse transform, inverse
6 quantized value was plus 7. Okay? So now we've got a
7 predicted value of plus 41, and an inverse quantized value
8 that has been added to it, so now we're at plus 48.

9 Do you see that?

10 A. So, again, now you're going back to an individual
11 pixel and you're using various terminology. My terminology
12 would be more straightforward as it pertains to the case.
13 We do inverse, as you said, inverse quantization, inverse
14 transform. We add that prediction error signal to the block
15 and we get a reconstructed block.

16 But here you're now doing these little bar graphs
17 with pixels and using various terminology from the case. So
18 I guess I don't -- unless I can fully understand the
19 question, I can't agree with your question.

20 Q. Well, the reconstructed instructed block is a set
21 of pixels, isn't it?

22 A. Can you say that again?

23 Q. The reconstructed block is a set of pixels, isn't
24 it?

25 A. So a reconstructed -- if you now take the -- I

1 think I understand your question. If you take inverse
2 transform -- inverse quantization and inverse transform and
3 add together and now you get a reconstructed block, which is
4 an array of pixels.

5 Q. That's right, and I want to focus on one of those
6 pixels. Okay?

7 A. Okay.

8 Q. All right. So this is the one we're focusing on.
9 So what we have here is the addition of the predicted value
10 and the result of the inverse transform, inverse quantized
11 value, and the gap that is left there between the 48 and the
12 55, that is part of the difference between the original set
13 of values and the predicted set of values, isn't it?

14 A. I'm not sure I understand your question.

15 Q. Well, the original pixel value is 55. We
16 performed a prediction on the block. And we ended up with a
17 pixel value of 41. We then performed inverse transform,
18 inverse quantization on the prediction error. And we ended
19 up with a plus 7 for this particular pixel.

20 So now we have a value of plus 48 for this pixel
21 and the original value was plus 55. And the gap that's left
22 between the 48 and 55, that's part of the difference between
23 the original value and the predicted value, isn't it?

24 A. I don't think I can agree with the way you've
25 framed the question. Again, we're talking about doing these

1 operations on blocks and you use "pixel" in the question.

2 Q. Yes, but pixels are part of a block, sir. The
3 pixels have values. We add values to the pixels. Don't we?

4 A. Yes, but then you talked about applying the
5 transform to a pixel. That's not how it works.

6 Q. No, sir. We applied the transform to the block,
7 inverse transform, inverse quantization. We ended up with a
8 set of pixels, and we're focusing on one of them right now.
9 Okay?

10 A. Okay.

11 Q. All right. And the difference between the
12 original value for this particular pixel and the predicted
13 value for this particular pixel was the difference between
14 55 and 41, which is 14. Right?

15 A. Could you repeat the question?

16 Q. The difference between 55 and 41 is the -- I'm
17 sorry -- the prediction error. We performed inverse
18 transform and inverse quantization. We ended up with plus
19 48. And all I'm asking you is if that gap at the top there
20 is part of that difference?

21 A. So I think I'm okay with your question, just with
22 the understanding that the transform is performed on a
23 block-by-block basis. You're now looking at a single pixel
24 and you're asking about the difference between 48 and 55.
25 And I agree that there's a difference. Now, let's be sure

1 we get the arithmetic correct of 7.

2 Q. Okay. And that, sir, in that gap right there,
3 that's where SA0 offsets go, correct?

4 A. No.

5 Q. Well, you agree with me that the addition of the
6 prediction and the prediction error is the reconstructed
7 value, correct, sir?

8 A. So I agree that if you take the prediction error
9 signal and add it to the predicted block, you get a
10 reconstructed image.

11 Q. Yes, sir. And there can be reconstructed pixels
12 as well, right?

13 A. Well, I mean, a reconstructed image, it consists
14 of pixels. I agree with that.

15 Q. That are reconstructed, correct?

16 A. The pixels are part of the reconstructed image
17 after employing, in your example, transform and quantization
18 coding.

19 Q. Okay. Now let's pull up a paper you cited,
20 CDX-20C.19. I'm sorry.

21 Can I have CDX-33C.19, please. Thank you?

22 Okay. Sir, you cited this paper. You discussed
23 it in your direct testimony, right?

24 A. This is a paper that I cited in my direct
25 testimony.

1 Q. Okay. And it says the SAO -- that's the Sample
2 Adaptive Offset, right?

3 A. Yes.

4 Q. Attempts to reduce the mean distortion between
5 original samples and reconstructed samples. Right? That's
6 what it says?

7 A. That's what it says.

8 Q. And samples are pixels, right?

9 A. Samples are -- the reconstructed -- yes, samples
10 are pixels.

11 Q. Okay. And so now let's go back to CDX-33C.16,
12 please. Actually, let's go to CDX-20C -- or 33C.20.

13 Okay. So now I've put that on here. The SAO
14 attempts to reduce the mean distortion between original
15 samples and reconstructed samples. Do you see that?

16 A. I see the quote, sure.

17 Q. And so SAO goes right there in that gap between
18 the reconstructed value, which is the green part plus the
19 orange part, and the original value. Doesn't it, sir?

20 A. No, I don't agree with your question.

21 Q. Is that because of the deblocking filter?

22 A. Well, that's another issue entirely. Deblocking
23 filter could come in between. The that's a possibility.

24 Q. The deblocking filter can be disabled, right?

25 A. Yes, the deblocking filter may be disabled.

1 Q. Let's assume it's disabled.

2 A. Same with SAO offset as well.

3 Q. Yes, sir. Let's assume the deblocking filter is
4 disabled. The SAO offset goes right there in that gap
5 between the 48 and the 55 between the original and the
6 reconstructed valued; isn't that true, sir?

7 A. No, I wouldn't agree with that.

8 Q. Well, you don't dispute that Dr. Orchard showed
9 testing screenshots that showed a coded prediction error
10 signal, including transform coefficients, right?

11 A. Could you repeat the question?

12 Q. Yes. You don't dispute that Dr. Orchard showed
13 testing screenshots that showed a coded prediction error
14 signal including transform coefficients, right?

15 A. I'm not exactly sure how he characterized it. It
16 sounds sort of reasonable, but I'd like to see what you're
17 referring to in terms of your terminology.

18 Q. Well, here's your report here.

19 A. Okay.

20 Q. You say, "I do not dispute that the screenshot
21 shows a coded prediction error signal that includes a
22 plurality of transform coefficients." Do you see that?

23 A. No, but I'm looking for it.

24 Q. It's right after --

25 A. Hold on a second.

1 Q. Right after the quoted language.

2 A. Let me take a quick look.

3 So I see where I say, "and I'll say I do not
4 dispute that the screenshot shows a coded prediction error
5 signal that includes a plurality of transform coefficients."
6 And so I believe that's what you asked, and therefore my
7 answer would be yes.

8 Q. Okay. And you don't dispute that the H.265
9 standard describes a decoder that decodes a plurality of
10 transform coefficients into transform information, right?

11 A. That -- I do not dispute that.

12 Q. Okay. And you don't dispute that the accused
13 products receive the SAO parameters, sao_offset_abs and
14 sao_offset_sign, right?

15 A. Could you repeat the question?

16 Q. You don't dispute that the accused products
17 receive SAO parameters, do you?

18 A. I do not.

19 Q. And you don't dispute that the accused products
20 receive SAO parameters, sao_offset_abs and sao_offset_sign,
21 right?

22 A. I do not dispute that.

23 Q. Okay. And if we look back here at the bottom
24 part of this quote, the way that SAO works is that it
25 classifies the reconstructed samples into different

1 categories, right?

2 A. There's a non-linear filter applied -- yeah, so I
3 think -- you phrased the question with a lot of terminology.
4 The --

5 Q. It'd proposes -- sir.

6 A. Okay. Right. Rephrase your question --

7 Q. Classify or reconstruct --

8 THE REPORTER: I'm so sorry. One at a time,
9 please.

10 A. Just let me finish, yeah. You phrased it with a
11 lot of terminology, so you want to be careful. Okay? So
12 I'm fine with the quote here, and let me read it. "The SAO
13 attempts to reduce the mean distortion between original
14 samples and reconstructed samples." That's fine, but the
15 question had a lot in it, so if you want to go ahead and
16 repeat it, I will -- now I forget what I was going to say.
17 But I'll go ahead and answer once you've repeated it.

18 Q. Sir, SAO classifies reconstructed samples into
19 different categories, right?

20 A. So --

21 Q. It's --

22 A. There is a classification process in the
23 non-linear filter. So, generally speaking, I would agree
24 with that. There are a lot of technical details you left
25 out, but generally speaking I would agree with that.

1 Q. Okay. And according to this quote here from the
2 paper that you cited, it then obtains an offset for each
3 category, right?

4 A. So, again, yes, there's a computational process.
5 We're only talking four parameters that are sent. There's a
6 computational process which does evaluate each pixel in the
7 reconstructed image. That's correct.

8 Q. Okay. And then it adds the offset to each sample
9 of the category without signaling the locations to the
10 corrected samples, correct, sir?

11 A. I couldn't hear you. Could you speak a little
12 louder?

13 Q. Yes, sir. It obtains an offset for each category
14 and then it adds the offset to each sample of the category,
15 right?

16 A. That's -- that's a high level description.
17 There's a lot of detail missing there, but I have no problem
18 with that.

19 Q. Okay. Thank you, sir.

20 MR. LIPSCHITZ: I'm going to pass to my
21 co-counsel here regarding the other patent.

22 CROSS-EXAMINATION

23 BY MR. HAYNES:

24 Q. Good afternoon, Dr. Storer. We haven't met. My
25 name is John Haynes. Good to meet you.

1 A. Good afternoon.

2 Q. I'm going to start by asking you a favor. I have
3 a lot to cover and very little time. So I'm going to frame
4 my questions as yes-or-no questions, and I would like you to
5 answer them as either yes, no, or I can't answer yes or no.
6 Then if I want an explanation, I'll ask for it or your
7 counsel can ask for it after we're done. Can you do that
8 favor for me?

9 A. I'll do my best.

10 Q. Okay. So let's just start with some really easy
11 stuff that I hope we can just answer yes or no. Okay? Are
12 you with me?

13 A. I am.

14 Q. All right. Let's see what we can do. All right.
15 In this case, you reviewed video coding
16 standards, true?

17 A. True.

18 Q. Okay. In this case, you reviewed video coding
19 technical specifications?

20 A. True.

21 Q. Okay. You also looked at the source code that
22 Dr. Kia and Dr. Orchard printed out?

23 A. Yes.

24 Q. And you focused your analysis on only the
25 portions of the code that Dr. Kia or Dr. Orchard identified.

1 Fair?

2 A. More or less fair. I looked at a lot of source
3 code. I looked through all of it. But I was focused on
4 what they identified. So I think that's fair.

5 Q. Did you actually go and review, look at the
6 source code computers with all the code on them?

7 A. I went -- spent a day with all the paper
8 printouts, yeah.

9 Q. With the paper printouts --

10 A. Yes.

11 Q. -- but not the actual source code computer that
12 had all of the code that Dr. Kia and Orchard may not have
13 printed, right?

14 A. That's correct.

15 Q. And you never tried to compare the source code
16 that was produced in this case to see how that code worked
17 or whether it implemented the video coding standards at
18 issue here, right?

19 A. I didn't try to do what Dr. Kia was supposed to
20 do. So I looked at -- I looked at the paper and the source
21 code that was produced by Dr. Kia, and I was a rebuttal
22 witness, so I think that's correct.

23 Q. You didn't view it as your job to figure out how
24 the products actually worked; you were just here to look at
25 what Dr. Kia or Dr. Orchard did, right?

1 A. Well, in the process of looking at what they did,
2 I have to understand how the products work. But I think I
3 generally understand what you're trying to say. And I was a
4 rebuttal witness and looked at the evidence that Dr. Kia and
5 Dr. Orchard put forward. I would agree with that.

6 Q. Okay. Now, you understand that some of the
7 products in this case have something called the Fire
8 operating system?

9 A. I do.

10 Q. And you reviewed some XML files for the Fire
11 operating system?

12 A. I did.

13 Q. And that XML file demonstrated to you that the
14 Fire operating system had support for a software Codec for
15 H.264 and H.265, right?

16 A. It did.

17 Q. And at least some versions of that Fire operating
18 system also supported AV1, correct?

19 A. Some versions, yes, that's correct.

20 Q. Okay. And you also looked at some Android
21 operating system source code in this case, right?

22 A. Yes.

23 Q. And you looked at the public versions of Android
24 that Dr. Kia analyzed; is that right?

25 A. Correct.

1 Q. And in your review, you did not identify any
2 differences in the different versions of Android that were
3 relevant to the opinions you've offered here, right?

4 A. Again, I responded to Dr. Orchard. And I don't
5 believe he had any differences. So I guess it would be yes
6 in that sense.

7 Q. Okay. Same is true for the code you looked at
8 with respect to Dr. Kia?

9 A. Yes.

10 Q. Okay. We also saw some testimony in one of your
11 slides about parser code in connection with --

12 A. Could you say that again? I'm having a hard time
13 hearing.

14 Q. I'm sorry. Am I moving too far away from the
15 microphone?

16 A. It's probably my fault. Go ahead.

17 Q. You also testified earlier today about some
18 parser code in connection with NVIDIA chipsets, right?

19 A. I did.

20 Q. And you understand that the capability of NVIDIA
21 graphics processing units to decode and encode video depends
22 on both hardware and software, right?

23 A. Only -- I have to caution your question that some
24 software components are optional, so without specifying
25 which software, I guess I would agree with that question.

1 Q. You know exactly where I'm going. So give me two
2 more questions and I'll get there.

3 A. Well, I'm not sure, but --

4 Q. I'll keep them -- I promise --

5 JUDGE ELLIOT: Stop, stop, stop. Okay. So
6 please don't interrupt the attorney.

7 THE WITNESS: I apologize.

8 JUDGE ELLIOT: Please don't interrupt the
9 witness. We have one court reporter who has to listen to
10 individual words, okay? So just go slow. Go ahead.

11 MR. HAYNES: Thank you, Your Honor.

12 BY MR. HAYNES:

13 Q. Now, you would also agree that, without the
14 required software, NVIDIA GPU hardware cannot encode or
15 decode video, right?

16 A. Which required software are you referring to?

17 Q. Well, one of the things you relied on in your
18 testimony was a declaration from NVIDIA, right?

19 A. Yes.

20 Q. Okay. Did you review that declaration?

21 A. Yes.

22 Q. Okay. Can we bring up RX-5161C, please, at
23 paragraph 1. Sorry. Before you bring up paragraph 1, just
24 show the front page.

25 Is this the declaration that you reviewed, sir?

1 MR. HAYNES: Sorry, we need to go on the
2 third-party confidential record.

3 JUDGE ELLIOT: Very well.

4 (Whereupon, the hearing proceeded in confidential
5 session.)

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 BY MR. HAYNES:

3 Q. Now, in connection -- well, let me just back all
4 the way up. Joint Video Team. That's a consortium of
5 engineers from different companies that were all working
6 together to develop what became the H.264 standard.

7 Is that fair?

8 A. The team works together, yes.

9 Q. And the way, one of the ways that team worked
10 together was different individuals from different companies
11 would propose ideas for inclusion into the standard,
12 sometimes call it a contribution. Right?

13 A. Sure, yes.

14 Q. Then if the Joint Video Team collectively thought
15 it was a good idea, they would put it into the standard
16 itself in a draft?

17 A. That could happen, yeah. Sometimes it could be a
18 good idea and they still continued making changes but yes,
19 that could happen.

20 Q. They might still tweak it as things progress?

21 A. Yes.

22 Q. And then once it was in a draft standard, they
23 would write this reference code that you testified about,
24 right?

25 A. So, right. I think I discussed, we have a paper

1 document, you describe something, and now there is an effort
2 to now -- if it is adopted, to implement a reference coder
3 reflecting that paper document.

4 Q. The reference coder would be implemented itself
5 in reference source code. Fair?

6 A. Say that again?

7 Q. The reference coder would be implemented using
8 reference source code? Correct?

9 A. Well, the reference coder is source code if
10 that's what you're asking.

11 Q. Fair enough. And you understand that the JVT
12 members worked together to develop that reference code?

13 A. We saw my testimony, some members or some -- it
14 depends on which item is being implemented, who actually
15 works on the reference coder. We saw some testimony about
16 that today that I gave.

17 Q. Right. For example, one of the things we saw is
18 that sometimes a person would implement an idea that came
19 from a different company. Fair?

20 A. Well, in the abstract, we had some very
21 particular things I talked about here. In the abstract,
22 someone could be implementing something. The idea could
23 have come from a different company. In the abstract,
24 there's a lot of particulars I talked about, so I am not
25 sure how you're tying it to that, but okay.

1 Q. I am trying to understand how the process worked
2 in general.

3 A. Okay.

4 Q. I understand we looked at very specific
5 contributions and one specific example of how that was
6 implemented in the code. What I would like to understand is
7 just the general process that was used by the JVT to go from
8 the position of having a draft standard to having reference
9 code that implements the draft standard. Okay.

10 With that background in mind, you would agree
11 that it wasn't uncommon for company A to come up with an
12 idea and put it into the draft standard and someone from
13 company B to write the reference code for it. Right?

14 A. I haven't tried to tabulate, since this isn't
15 that nature, I can't really answer it one way or the other.

16 Q. For example, in your examples we saw that
17 originally Dr. Hannuksela was asked to implement the
18 proposals in that D145 document, correct?

19 A. Initially he was tasked, tasked with the project.
20 That's correct.

21 Q. Right. And that D145 project contained the ideas
22 from a bunch of different people, and the reason they asked
23 Dr. Hannuksela is because one of those ideas was his, and he
24 also happened to be the chair of that subgroup. Right?

25 A. No. That's not correct.

1 Q. Which part is not correct?

2 A. His ideas didn't go into the standard.

3 Q. Okay. So in your example then, the standard
4 asked Dr. Hannuksela to implement the reference code for
5 ideas that were entirely someone else's. Is that fair?

6 A. So let me just think about the words of your
7 question. He was tasked with the project. We saw that the
8 Sony proposal was what went in. So he was tasked with -- so
9 if you could rephrase your question, I think I can say yes,
10 but please rephrase it to be sure I have got it right.

11 Q. In your opinion, that's an example of Dr.
12 Hannuksela being asked to write the reference code for the
13 D145 document, which included ideas from multiple different
14 companies. Fair?

15 A. Fair only but just to caution that it didn't
16 include the two proposals for parameter sets that were made
17 by Nokia.

18 Q. I understand that you rendered that opinion. My
19 question is more just about the process of how the JVT
20 worked.

21 You agree that the development of that reference
22 code as part of the Joint Video Team, it was not unusual at
23 all for somebody to implement the reference code for ideas
24 that were contributed by someone else?

25 A. I think you asked the same question before and I

1 said I couldn't answer one way or the other because I
2 haven't tabulated statistics on how frequent or usual things
3 were.

4 Q. I think there was also some questions asked of
5 you about Dr. Hannuksela's skills. There was an e-mail
6 where he said he didn't have the requisite skills to
7 implement D145 or something like that.

8 Do you recall that generally?

9 A. I wouldn't characterize it that way. I was asked
10 a question about a document he wrote.

11 Q. Fair enough. But you understand that Dr.
12 Hannuksela was a skilled video coding expert, right? You
13 weren't trying to suggest that he wasn't?

14 A. I'm not -- I haven't tried to testify about his
15 abilities one way or the other.

16 Q. Okay. But you know that the experts of the JVT
17 pointed to him as the chair of the subgroup that was looking
18 at the syntax related to parameter sets, right?

19 A. We saw that in that memo, yes.

20 MR. HAYNES: No further questions, Your Honor. I
21 will pass the witness.

22 One thing I would like to note, I stayed on the
23 confidential record longer than I should have. I would
24 propose that we meet and confer with the other side and try
25 to make more of the transcript public from earlier today if

1 that's acceptable to Your Honor.

2 JUDGE ELLIOT: Yes, please. And we had this
3 issue, a similar issue yesterday. Did you work it out?

4 MR. HAYNES: We did work it out and I believe
5 that has been agreed, Your Honor. I don't know if it is
6 announced, but we will make sure that it gets into the
7 record.

8 JUDGE ELLIOT: Just tell the court reporter.

9 MR. HAYNES: We will do so.

10 JUDGE ELLIOT: Ms. Ducca.

11 MS. DUCCA: No questions from Staff, Your Honor.

12 JUDGE ELLIOT: Very well. Mr. Klein.

13 MR. KLEIN: Thank you, Your Honor. A few short
14 questions.

15 REDIRECT EXAMINATION

16 BY MR. KLEIN:

17 Q. May we have JX-002, page 179.

18 Dr. Storer, is this an excerpt from the
19 prosecution history of the '818 patent?

20 A. Yes.

21 Q. Does this excerpt show the rules Nokia provided
22 to the USPTO when it was prosecuting the claims of the '818
23 patent?

24 A. Let me take a quick look. Yes.

25 Q. Where are they?

1 A. So let me read down below. "In particular,
2 parameters whose values may change in every slice or whose
3 value is likely to change in every picture are included in
4 the slice header. Whereas parameters that remain unchanged
5 in multiple pictures, but are allowed to change in every
6 picture are included in a picture parameter set." I am
7 watching her highlighting. There we go.

8 "Such parameters which are not allowed to change
9 in a coded video sequence are included in a sequence
10 parameter set." Then it goes on.

11 Do you want me to continue reading? Or is that
12 sufficient?

13 Q. That's good. Are these the rules you applied in
14 your analysis?

15 A. So I did analyze those rules, yes. That's the
16 second set of rules I referred to that were given in the
17 prosecution history.

18 Q. Did Dr. Kia mention these rules during his
19 testimony?

20 A. I don't recall that.

21 MR. KLEIN: Nothing further, Your Honor.

22 JUDGE ELLIOT: No? All right. Very good. Okay.

23 Mr. Storer, thank you very much.

24 THE WITNESS: Thank you.

25 (The witness stood down.)

1 MR. HOUMAND: Good afternoon, Your Honor, Corey
2 Houmand from Morgan Lewis. Respondents call Dr. Dan
3 Schonfeld as their next witness.

4 Whereupon--

5 DAN SCHONFELD,
6 having been first duly sworn/affirmed, was examined and
7 testified as follows:

8

9 THE WITNESS: I do.

10 JUDGE ELLIOT: Have a seat.

11 MR. HOUMAND: Your Honor, may I proceed?

12 JUDGE ELLIOT: Yes. By the way, the microphones
13 in front of you, they should be green.

14 THE WITNESS: They are.

15 JUDGE ELLIOT: Okay.

16 DIRECT EXAMINATION

17 BY MR. HOUMAND:

18 Q. Good afternoon, Dr. Schonfeld.

19 A. Good afternoon.

20 Q. Can you please introduce yourself to the ALJ.

21 A. Sure. My name is Dan Schonfeld. I live outside
22 of Chicago area. I have worked at the University of
23 Illinois, Chicago for the past 34 years.

24 Q. Dr. Schonfeld, did you work with us to prepare
25 some slides to assist with your testimony?

1 A. I did.

2 Q. Are we seeing them on the screen as RDX-96C.1?

3 A. That's correct.

4 Q. And if we advance to slide 2, what topics do your
5 slides address?

6 A. My -- the focus of my presentation is on '714 and
7 '267 patents.

8 Q. Let's now advance to slide 4. You mentioned that
9 you have been a professor at the University of Illinois,
10 Chicago, for the past 30 or so years. Has your work
11 involved any video processing?

12 A. Yes, it has.

13 Q. Can you go into some detail about that.

14 A. Sure. So I have done work. I have introduced a
15 new course in multimedia systems which covers various issues
16 of video focusing on the standards. My research work has
17 focused on various areas of video processing, including
18 doing work in tracking and compressed domain, some areas of
19 video coding and various other aspects of video compression
20 and communications.

21 And I have also served as an editor-in-chief of
22 the main journal in the area of video technology. And that
23 covered a lot of the papers that we have seen in the court
24 this week.

25 Q. Continuing on to slide 5, would you give us a

1 brief overview of your educational background and your
2 professional accomplishments, particularly as they relate to
3 video processing.

4 A. Sure. I got my undergraduate degree from
5 Berkeley, my graduate degree from Johns Hopkins. I was
6 published over the years, last time I counted was somewhere
7 over 250 papers. And I have been elected to both the IEEE
8 and SPIE, both in video-related topics. I have also been
9 elected the university scholar of the University of
10 Illinois.

11 As I mentioned, the first topic under
12 professional service is the editor in chief of the IEEE
13 Transactions on Circuits and Systems for Video Technology,
14 which you have seen repeatedly in the courtroom this week.

15 Q. Dr. Schonfeld, have you previously been qualified
16 as an expert witness in cases involving video coding
17 standards?

18 A. Yes, I have.

19 Q. Which video coding standards were at issue in
20 those prior cases?

21 A. There were a number of them. They included
22 MPEG-2, MPEG-4, H.264, H.265, and AV1.

23 MR. HOUMAND: Your Honor, at this point,
24 Respondents tender Dr. Schonfeld as an expert in image and
25 video processing, including the subject matter of the '267

1 and '714 patents.

2 JUDGE ELLIOT: Very well.

3 BY MR. HOUMAND:

4 Q. Dr. Schonfeld, let's move to slide 6. Are you
5 aware that both Complainants and Respondents have proposed
6 slightly different levels of ordinary skill in the art?

7 A. Yes, I am aware of that.

8 Q. At the time of the '714 and '267 patents, did you
9 qualify as a person of ordinary skill under both
10 definitions?

11 A. Yes, I did.

12 Q. Did you apply these definitions in arriving at
13 your opinions in this case?

14 A. Yes, I have.

15 Q. And are the opinions you are about to provide the
16 same under both proposed definitions?

17 A. Yeah, they would remain unchanged.

18 Q. Through your work in this case, have you formed
19 any opinions relating to the '714 and '267 patents?

20 A. Yes, I have.

21 Q. Moving to slide 7, can you briefly describe the
22 opinions that you have reached?

23 A. Sure. So there are four main opinions. The
24 first one that in my view the asserted claims are not
25 infringed by the Amazon and HP products. The second one is

1 that for a very similar reason, there is no evidence that
2 the technical domestic industry practices those asserted
3 claims. And, in addition, the asserted claims are in my
4 view obvious over the prior art. And, finally, they are
5 directed to well-known, routine, and conventional
6 technologies.

7 Q. Let's discuss the '714 patent first. And on
8 slide 9, what are we seeing?

9 A. So this is the title of the patent. You can see
10 the title over here, one of the inventors who gave a
11 deposition testimony is highlighted, Mr. Lainema. The
12 provisional -- the priority date of November 4th, 2011 is
13 also mentioned on the bottom.

14 Q. Is there a shorthand that you use to refer to the
15 '714 patent?

16 A. Yeah. I refer to it loosely sometimes as
17 comparing less than everything patent, just to summarize the
18 alleged invention.

19 Q. On slide 10, what is your understanding of the
20 '714 patent subject matter?

21 A. So the '714 patent is focused as it says on the
22 first line, generating motion vector prediction lists. And,
23 in particular, the focus is on reducing the complexity by
24 reducing the number of comparisons that are performed in the
25 generation of the list.

1 Q. I want to move to slide 11 and talk about motion
2 vector prediction list. What was the state of the art
3 concerning these lists at the time of the '714 patent?

4 A. So at that time, there was already a Working
5 Draft. It was called Working Draft 3 of the HEVC. HEVC and
6 H.265 I use interchangeably. And that already included that
7 what is known as merge mode and motion vector prediction,
8 which included the generation of a list of candidate
9 predictions and the ability to choose a candidate.

10 Q. Are motion vector prediction lists transmitted in
11 a bitstream?

12 A. No, they are not.

13 Q. What is transmitted in a bitstream as it relates
14 to these lists?

15 A. So the list is generated by the encoder and by
16 the decoder. The only thing that is transmitted is an index
17 that specifies which element of the list the decoder should
18 use.

19 Q. Let's now talk about the candidates that go on
20 the list. We are on slide 12.

21 Can you explain what we're seeing with respect to
22 Figure 9?

23 A. Sure. So Figure 9 is a figure from the patent.
24 It shows some of the candidates. You can see that we are
25 trying to code block 900, which is in the center. And then

1 various candidates, A0, A1, B0, B1, and B2 are around it.

2 Q. Now, in terms of the candidates, did the '714
3 patent come up with these candidates or did they preexist?

4 A. No, they preexisted. They were part of WD3 and
5 they were changed by another proposal to the HEVC standard
6 by Nakamura.

7 Q. Let's move to slide 13. This slide mentions
8 removing duplicate candidates. What is that referring to?

9 A. When you form the list, you sometimes have the
10 same motion vector twice. And if you do that, you do an
11 inefficient job because the resulting motion vector that you
12 have to transmit to point to it would be too long and not
13 efficient. So you just simply look at them, see if they are
14 the same and then delete it if it is identical. And that's
15 what this is referring to.

16 Q. This removal concept, did the '714 patent come up
17 with this or did it also preexist?

18 A. That was part of the existing Working Draft at
19 the time.

20 Q. So given that the motion vector prediction lists
21 were known, the candidates that go on the list were known
22 and removing candidates from the list was known, what is
23 your understanding of the '714 patent's invention?

24 A. So according to the applicants, the main idea
25 from their perspective was comparing all the elements in the

1 list takes too long. It is inefficient. Therefore, let's
2 compare only some parts of it and not others to make it more
3 efficient and faster and more resource efficient.

4 Q. Let's move to slide 14.

5 What is your understanding of the asserted claims
6 of the '714 patent?

7 A. So they are decoding and encoding claims. They
8 are both apparatus claims. The encoding claim is claim 15.
9 The decoding claim is claim 23. And they have corresponding
10 limitations between them.

11 They are written in slightly different form
12 between the encoding and decoding but they address the same
13 issues from the two perspective of the decoder. And the
14 decoder, and I have color coded them, so that the
15 corresponding limitations have the same color.

16 Q. If we turn to slide 15, and use the decoding
17 claim as an example, can you give us a brief walkthrough of
18 the elements that are recited?

19 A. Okay. So this is just at a very high level. You
20 can see in element 23B there is a selection of first spatial
21 motion vector prediction candidate. In this case, you're
22 looking at one of the candidates. I am going to choose A0
23 arbitrarily. Then you determine a subset for that candidate
24 in element 23c, for example, you might determine the subset
25 to be A1. And then you compare the motion information

1 between the two of them in 23d, so you compare the motion
2 information between A0 and A1.

3 And based on the determination in element 23e,
4 you decide whether to include the first candidate, A0, in
5 the list or not. And then at the very end in 23f, once you
6 have formed the list, you then identify a particular element
7 of the list to indicate to the decoder that that's the one
8 it should use.

9 Q. On slide 16, can you provide us with your
10 understanding of the accused portion of H.265?

11 A. This is focused on Section 8.5.3.2.3. You can
12 see the very similar figure to what is in Figure 9 of the
13 patent. And these are the candidates that are used to form
14 the list in H.265.

15 Q. And on slide 17, I have seen three pages of text
16 here. What is this?

17 A. So this is the actual instructions from the point
18 of view of H.265 decoding standard of exactly what needs to
19 go into the mechanism. It doesn't specify how the decoder
20 should work, but it specifies what should be the syntax
21 input and the corresponding output.

22 And it goes through each and every candidate.
23 Just for simplicity, I will just choose one of them. And
24 that happens to be the one corresponding to B1 in that list.
25 I have highlighted it and shown it over here. You can see

1 it comes from that section that is in blue on the screen.

2 And then you can see within it, you have an
3 element that it is compared to that is element A1 that
4 appears under bullet Number 2 towards the end.

5 Everything in this entire description is
6 predefined. There is no room for doing any kind of
7 selection or determination. You just simply, once you know
8 B1, you know what you compare to. It is A1. It is just so
9 -- follows a set of predefined rules.

10 Q. Let's move to the topic of non-infringement. And
11 on slide 19, are these your non-infringement opinions for
12 decoding claim 23?

13 A. They are.

14 Q. On slide 20, what is your first non-infringement
15 opinion?

16 A. So the first one is focused on the fact that
17 there is no motion vector prediction list constructed by an
18 encoder that corresponds to the list on the decoder side.

19 Q. And if we move to slide 21, we have the final
20 element of claim 23 on the screen, 23f. And what is your
21 understanding of the requirements of this claim element?

22 A. So you can see that the term motion vector
23 prediction list appears here three times, in all three cases
24 with an antecedent basis, with the word "the" in front of
25 it. And the first one is talking about the motion vector

1 prediction list for use in decoding.

2 The next one is about using it from the
3 information received. And the final one specifies that it's
4 the same one that is constructed by an encoder.

5 So the claim limitation requires, as I understand
6 it, to have a motion vector prediction list on the decoder
7 side and the same motion vector prediction list on the
8 encoder side.

9 Q. On slide 22, it looks like we have encoder -- an
10 encoder list and a decoder list. What is being illustrated
11 on this slide?

12 A. So this is what it would take to satisfy this
13 particular limitation. And what I have shown over here on
14 the encoder side on the left, you can see the list of
15 candidates that would be the resulting motion vector
16 prediction list on the encoder, consisting of A1, B1, B0,
17 and A0.

18 And on the right, the same motion vector
19 prediction list, A1, B1, B0, and A0. Of course the selected
20 candidate specifying which of those candidates should be
21 used by the decoder.

22 Q. In your opinion, does the H.265 standard require
23 an encoder and decoder to construct the same motion vector
24 prediction list?

25 A. No.

1 Q. If we move to slide 23, can you describe what is
2 being illustrated here?

3 A. Sure. So this is an example of something that
4 would be consistent with the decoder and consistent with the
5 standard but would not satisfy the claim limitation. And
6 the reason for it, as you can see on the left you have an
7 encoder that consists of the same list as before, A1, B1,
8 B0, and A0. Yet on the right, it just simply consists of
9 A1, and B1. And then it stops.

10 So they are not the same motion vector prediction
11 list.

12 Q. Is there a reason why a decoder would construct a
13 motion vector prediction list in the manner shown on slide
14 23?

15 A. Yeah. There is. And the reason is because it
16 knows the decoder receives the merge index from the encoder.
17 It knows that after it constructs that list it will not need
18 to look at anything past the merge index position. And,
19 therefore, it would be unwise to waste resources to build a
20 list just to discard those elements of the list later on.

21 And so the decoder would know that you would get
22 exactly the same result if you were to stop after the merge
23 index has been reached.

24 Q. And did you see an implementation like this in
25 the source code identified by Dr. Moulin?

1 A. I have seen several.

2 MR. HOUMAND: Your Honor, at this point, I would
3 like to go on the confidential record for the next three
4 slides, because of third-party CBI.

5 JUDGE ELLIOT: Very well.

6 (Whereupon, the hearing proceeded in confidential
7 session.)

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 BY MR. HOUMAND:

3 Q. Dr. Schonfeld, what is your second
4 non-infringement opinion for decoding claim 23?

5 A. In my opinion the limitation that requires
6 determine a subset based on location is not satisfied.

7 Q. Let's move now to slide 29. Here we have element
8 23c that has been highlighted in two colors.

9 Do you know why?

10 A. I do.

11 Q. Can you explain?

12 A. Well, because I have two separate opinions about
13 the two sections. First, it requires that there be an
14 actual determination of a subset. And then, secondly, it
15 requires that that determination be based upon the location
16 of the block.

17 And so I have separated the two opinions for the
18 two sections of the limitation.

19 Q. Let's discuss the yellow part first. On slide
20 30, we have an excerpt of H.265. Can you explain to us how
21 Nokia is reading the claim element on to this part of the
22 standard?

23 A. Sure. So and my understanding of Nokia's view is
24 that when you go through this particular section of the
25 standard, and you can see at some point it looks at the

1 element A1 when it devaluates the list potential candidate
2 B1, it then uses it to determine the motion vector
3 similarity.

4 And so it refers to the fact that A1 is being
5 compared as part of the predefined rules that are provided
6 by H.265 as meeting the alleged determination.

7 Q. What is your take on this? Do you agree that
8 there's a determination of the subset -- of a subset in this
9 portion of H.265?

10 A. No, I do not. It is exactly the opposite. There
11 is no determination whatsoever. It's a set of predefined
12 rules. They were written into the standard. And,
13 therefore, have to be applied as exactly as written.

14 Q. Did you reach the same conclusions about Nokia's
15 other alleged determination of subsets for the other B0, A0
16 and B2 candidates?

17 A. That's right. For all of the other alleged
18 determinations, it's exactly the same -- same opinion for
19 the very same reason, they are all predefined rules written
20 into the standard.

21 Q. Let's now turn to slide 31 and discuss the second
22 part of this claim limitation that is highlighted in green.
23 And I will just read it in the record.

24 It requires the determination of a subset to be
25 based on the location of the block associated with the first

1 spatial motion vector prediction candidate.

2 My question to you, Dr. Schonfeld, is do you have
3 an understanding about what the block, which is highlighted
4 in blue on this slide, refers to in the claim language?

5 A. So my understanding of what the block refers to,
6 it refers to in an antecedent basis, to the previous
7 reference to the block of pixels, which appears in the
8 previous limitation, 23b.

9 And as you can, it has a reference to the encoded
10 block of pixels. That would be block 900 in the center of
11 Figure 9.

12 Q. Do you have this same understanding of the term
13 "the block" as it is used in claim 15?

14 A. I do. It's exactly the same.

15 Q. And with this understanding in mind, does H.265
16 determine a subset based on the location of the block
17 associated with the first spatial motion vector prediction
18 candidate?

19 A. No, it does not. Because as you saw, the
20 predefined rules in the standard are exactly the same and
21 they are completely independent of the block you're
22 encoding. You always apply the same rules for the same
23 candidate for any block.

24 Q. Were you here in court for Dr. Moulin's testimony
25 yesterday?

1 A. I was.

2 Q. Was there anything that you heard from Dr. Moulin
3 that supported your opinions in this regard?

4 A. My recollection is that he agreed with me on this
5 issue.

6 Q. Now, how does Nokia interpret the meaning of the
7 block in element 23c?

8 A. So my understanding of and Nokia's understanding
9 of interpretation of claim element 23c is that the term "the
10 block associated with a first spatial motion vector
11 prediction candidate" should be read as the block
12 corresponding or the actual first spatial motion vector
13 prediction candidate and not the association established
14 through element 23b.

15 Q. In your opinion, is element 23c met under Nokia's
16 interpretation of the block?

17 A. In my view, no.

18 Q. And why not?

19 A. Because if you were to look and consider, for
20 example, one of the candidates as being the block, A0, and
21 then look at another potential determination of a subset,
22 again, it's predefined and it would be exactly the same in
23 the same exact relation, no matter which portion of the
24 image you're looking at. All these subsets are predefined.

25 MR. HOUMAND: Your Honor, at this point, I would

1 like to go on the confidential record for one slide, again,
2 because of third-party CBI.

3 JUDGE ELLIOT: Very well.

4 (Whereupon, the hearing proceeded in confidential
5 session.)

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 BY MR. HOUMAND:

3 Q. And while folks are coming back in,
4 Dr. Schonfeld, can you summarize what we're seeing on slide
5 34?

6 A. Yeah. This is a summary of the reasons why I
7 believe claim 23 is not infringed by the asserted -- by this
8 particular claim. And the accused products are not
9 infringed by those claims -- by this claim. And there are
10 two reasons.

11 One we just discussed, no determination of a
12 subset because it is predefined and it's certainly not based
13 on location. And then the other one, the requirement for a
14 list on the decoder and the list on the encoder being the
15 same is has not been proven. And in many cases, it is -- it
16 actually is completely different and is not the same list on
17 both sides.

18 Q. Let's move on to the encoding claim 15 on slide
19 35. Let me just ask you, is Nokia asserting claim 15
20 against the HP and Amazon accused products or only some of
21 the accused products?

22 A. Just the HP accused products.

23 Q. And on slide 35, are these your non-infringement
24 opinions for claim 15?

25 A. They are.

1 Q. Now, correct me if I am wrong, but I believe you
2 already addressed the first opinion in the context of claim
3 23. Is that right?

4 A. That's right. My opinion about the determination
5 based on the block is exactly the same for claim 15 as it is
6 for 23.

7 Q. Okay. So on slide 36, what is your second
8 non-infringement opinion for claim 15?

9 A. So for the encoding claims, Nokia primarily
10 relied on a VQ Analyzer analysis. You saw some of it in
11 court this week. And that is a particular software tool
12 that does -- it looks at the bitstream in encoded form at
13 the output of the encoder, and then it does some analysis to
14 see what's inside the bitstream itself.

15 Q. Let's move to slide 37. There's a screenshot on
16 this slide.

17 Can you describe what we're seeing?

18 A. So this is an example of Nokia's screenshot of
19 what you can get, some information you can get from the VQ
20 Analyzer when it looks at the bitstream.

21 Q. So let me ask you, can you learn anything of
22 interest from this screenshot as it relates to claim 15?

23 A. You can learn some things. You can, for example,
24 you can see on the bottom the merge index that has been
25 identified in this case has been marked by an asterisk next

1 to the Number 2. You can see which particular members of
2 the candidate, the neighbors made it on to the list. So you
3 can get some information from it.

4 Q. In your opinion, what doesn't this screenshot
5 tell you as it relates to claim 15?

6 A. So this is a tool that is sitting outside of the
7 encoder. It is only looking at the encoded bitstream. It
8 cannot say anything about what's happening inside the
9 encoder.

10 And because the claim limitations require
11 particular steps to be satisfied on the encoder, such as a
12 selection determination comparisons, none of it is
13 available. You only see the end result when you're looking
14 at the VQ Analyzer.

15 So in my view, that entire analysis does not
16 allow you to obtain any conclusion as it comes to -- as it
17 relates to many -- most of the claim limitations of the
18 encoding claims.

19 Q. And if we move to slide 38, is this a list of the
20 limitations that you believe are missing from claim 15 in
21 the HP accused products?

22 A. Yeah. That's correct. It includes both the ones
23 I just mentioned, that because VQ Analyzer cannot determine
24 and ascertain the selection, the determination and the
25 comparison, as well as the old opinion that I gave with

1 relation to claim 23, that the determination of a subset
2 based on location is not satisfied for the previous reasons
3 I mentioned.

4 Q. Let's transition now to the topic of '714
5 patent's invalidity. What prior art did you analyze,
6 Dr. Schonfeld, in coming to your obviousness opinions?

7 A. I looked at the combination of the Nakamura
8 reference and something called WD4.

9 Q. Let's move to slide 40. And can you provide us
10 with your understanding of the Nakamura reference?

11 A. So the Nakamura reference was a proposal to the
12 HEVC standard, to the H.265 standard. It was provided by
13 Nakamura and his colleagues. It was a set of documents
14 presented together for the actual proposal and it was
15 labeled as F419. And it was done on July 2011.

16 Q. Let's move to slide 41.
17 What was Nakamura's proposal?

18 A. So Nakamura's proposal had two suggested ideas.
19 It was built upon Working Draft 3 of the HEVC standard. And
20 the two ideas were to take the concept of motion vector
21 prediction and merge mode and unify the two of them into a
22 common approach.

23 Secondly, the second idea was to reduce the
24 number of comparisons required for both of these
25 applications to make it more efficient in processing.

1 Q. Let's talk about the unification part first. On
2 slide 42, how do Nakamura's spatial candidates compare to
3 the spatial candidates in -- or the alleged spatial
4 candidates in H.265?

5 A. So this particular proposal by Nakamura adopted
6 what was used only for motion vector prediction. A
7 different one was used for merge mode. Nakamura modified
8 it.

9 And that idea was adopted by H.265. And as you
10 can see it is exactly the same, just the labels have changed
11 from A, B, C, D, E, to the labels A0, A1, B0, B1, and B2.
12 And that same graph has been also adopted in Figure 9 of the
13 patent.

14 Q. Now, on slide 43, let's talk about the second
15 aspect of Nakamura, which is reducing comparisons.

16 Can you explain how Nakamura proposed that work?

17 A. Sure. So the second part was that the number of
18 comparisons in Working Draft 3 for merge mode required too
19 many comparisons. And this is exactly the same idea that
20 the inventors of the '714 patent thought that they came up
21 with, but this was Nakamura's invention a little bit
22 earlier.

23 And that was the reduction of the number of
24 comparisons. As you can see in Nakamura, you have A, B, C,
25 D, E. That's the set. And that is a set of five

1 candidates. Normally five candidates would require ten
2 comparisons.

3 Nakamura proposed to do just a single comparison
4 in that case.

5 Q. Moving on to slide 44, what is your understanding
6 of Working Draft 4, version 3 of the HEVC standard?

7 A. So the Working Drafts of the standard come at
8 regular intervals. I believe it is every four months. They
9 have proposals for individual committee meetings, and then
10 they come to a general meeting of the entire standard body
11 and they release a Working Draft standard at each quarterly
12 meeting.

13 And this is the one that was released in July
14 2011, so very shortly after Nakamura. And as you can see,
15 it actually addresses Nakamura at F419 on the right-hand
16 side. And it incorporated a part of Nakamura's proposal.

17 Q. Is it fair to say that Nakamura incorporated --
18 or, excuse me, that WD4 incorporated Nakamura's first
19 proposal about unifying the spatial candidates?

20 A. That's correct. It incorporated the way that the
21 candidates are laid out, the number of candidates, all of
22 that was incorporated in the unification of merge mode and
23 the motion vector prediction was incorporated into H.265.

24 Q. Let's move to slide 45. Can you provide us with
25 your understanding of the prior art status in Nakamura and

1 WD4?

2 A. Yeah, you can see the timeline. Working Draft 3
3 was released in March 2011. Nakamura was submitted in July
4 2011. Working Draft 4 was released in September 2011. And
5 the priority date for the '714 patent is later on in
6 November 2011.

7 Q. Now, did you consider any inventor testimony that
8 supported your obviousness opinions?

9 A. I did.

10 Q. Which inventor testimony?

11 A. This was Mr. Lainema.

12 Q. And if we move to slide 46, was there anything
13 noteworthy about his testimony that you relied on?

14 A. Yeah. He said that Nakamura addresses the same
15 problem as the '714 patent. He is unaware of any
16 differences or improvements of the patent -- of the '714
17 patent over Nakamura.

18 Q. Now, before we get into your analysis, are you
19 fine if I refer to a combination of Nakamura and WD4 as the
20 Nakamura combination?

21 A. Sure.

22 Q. Just so we all have it, can you explain how you
23 were combining Nakamura with WD4?

24 A. Sure. So Nakamura was written in the context of
25 the HEVC standard. So it refers to a bunch of terms, sort

1 of in a vacuum. But it is clear to everybody in the HEVC
2 community what they refer to, such as the term merge index
3 and such things.

4 So I am using the Nakamura reference and using
5 WD4, the Working Draft standard, as sort of the background
6 to fill in the missing pieces that Nakamura ignores. They
7 are mostly not missing pieces, they are just explanation of
8 what Nakamura is talking about.

9 Q. And if we transition now to slide 47, I want to
10 talk about the combination and the ability to make it. I
11 want to focus on the first bullet.

12 And can you explain -- let's focus on the first
13 bullet point first. Can you explain why a person of skill
14 would have been motivated to combine Nakamura with WD4?

15 A. Yeah. Sure. So Nakamura, first of all, had
16 already been partially combined because WD4 had adopted a
17 portion of Nakamura's proposal. Secondly, WD4 and Nakamura
18 address exactly the same problem in exactly the same context
19 within the HEVC standardization process. And they rely on
20 very similar teachings.

21 The technique that Nakamura is suggesting, the
22 pruning down of the number of comparisons to make it faster
23 is a known, well-known technique. If you just do fewer
24 comparisons, it will be faster.

25 And the fact that you get predictable results and

1 the reasonable expectation of success is clear based on
2 Nakamura because just simply pruning down the number of
3 comparisons will give you maybe a slightly inferior result
4 in terms of the quality of the merge index but much faster
5 or a little faster I should say.

6 Q. Let me just follow-up on the first bullet. And
7 you mentioned, we talked about this previously, that WD4 did
8 not adopt all of Nakamura's proposal. Correct?

9 A. That's correct.

10 Q. Does that have any impact on your obviousness
11 opinions?

12 A. Not really, no.

13 Q. Can you explain?

14 A. In Nakamura, is still in the -- is the main
15 reference I'm relying on. The fact that it was written with
16 WD4 in mind is clear from the context of Nakamura because it
17 builds on WD3, the predecessor to WD4, introduces code into
18 the test bed of WD3, which was ultimately part of WD4 in the
19 HM3, it became HM4. So in my opinion that has no relevance.

20 A person of skill would know how to use Nakamura
21 with WD4 as background material.

22 Q. And to streamline your opinions, did you work
23 with us to prepare slides that analyzed the common
24 limitations of 15 and 23 together?

25 A. I did.

1 Q. So let's dive into that on slide 48. Does the
2 Nakamura combination disclose element 15a and 23a that are
3 shown on this slide?

4 A. Yes. You can see that those elements require a
5 processor, a memory, as well as computer program code to
6 carry out the steps of the -- the various steps of the
7 asserted claims. And in Nakamura, you can see there is a
8 CPU, which is a processor, Intel Core, 16 gigabyte of
9 memory. This appears both on the encoder and decoder.

10 And all of the -- all of the steps of Nakamura
11 were implemented into a test bed as I mentioned earlier,
12 HM3.0 software system.

13 Q. Let's move now to slide 49 and discuss 15b and
14 23b.

15 In your opinion, does the Nakamura combination
16 disclose the highlighted portions of these elements that are
17 on slide 49?

18 A. Yes, it does. And let me go and explain what is
19 required at a high level. Both for 15b and 23b, you need a
20 first candidate to be selected from a set of candidates.
21 And it should include motion vector prediction -- it should
22 be included in a motion vector prediction list or
23 potentially included.

24 And as you can see in Nakamura, there is a set of
25 five candidates, A, B, C, D, E. And there is a selection of

1 one of the candidates, S1. In this example it happens to be
2 corresponding to element D. And all of that is for
3 potentially being included into what Nakamura calls the
4 merging candidate list. That corresponds to the motion
5 vector prediction list.

6 Q. Just to remind us, again, how does Nakamura set
7 of candidates compare to the alleged set in H.265?

8 A. It's exactly the same set as in H.265.

9 Q. Let's move now to slide 50.

10 Does the Nakamura combination disclose the
11 further portion of elements 15b and 23b that are highlighted
12 on this slide?

13 A. Yeah. You can see that here there is a
14 requirement that the motion vector prediction list include
15 motion information. Nakamura discloses that the prediction
16 list includes motion vectors.

17 And WD4 echoes exactly the same thing with almost
18 the same words. The prediction list includes motion
19 vectors.

20 Q. And let's move to slide 51 and talk about the
21 remaining portion of just element 15b. Dr. Schonfeld, in
22 your opinion, does the Nakamura combination disclose the
23 highlighted portion on slide 51?

24 A. It does. 15b is only on the encoder side. There
25 is no corresponding limitation on the decoder yet. And it

1 requires that there be an identification by the encoder of
2 the signalled member of the prediction list for use by the
3 decoder.

4 As you can see Nakamura, it defines the merge
5 index as a merging candidate list and describes it as a
6 merging candidate index of the merging candidate list
7 itself. And that is what has been identified prior to
8 transmission to the decoder.

9 Q. Let's move to slide 52 which deals with elements
10 15c and 23c. I want to break this one up the way you did
11 previously for non-infringement.

12 So, first, does the Nakamura combination
13 determine a subset of spatial motion vector prediction
14 candidates?

15 A. It does. In particular, you can see that the set
16 here was A, B, C, D, E. The candidate that was selected in
17 the example I have on the right is S1, which Nakamura refers
18 to as a second candidate. And then there is a determination
19 which is the earliest inter candidate available prior to D,
20 which has been selected as the subset. In this case it
21 happens -- and it is labeled as 0. In this case it happens
22 to be candidate B.

23 That is the mechanism by which Nakamura
24 determines a subset.

25 Q. And let's now go to the second part of this claim

1 element. In your opinion, is Nakamura's determined subset
2 based on the location of the block associated with the first
3 spatial motion vector prediction candidate?

4 A. It is. You can see that the way Nakamura works,
5 you can see on the upper right-hand side there is A, B, C,
6 D, E around the current block, and, in particular, depending
7 on where you are and what the status of the inter and intra
8 blocks around it, you will get different choices for the
9 subset as 0 for the corresponding S1 element block.

10 And it will change both as a function of the
11 current block, as well as a function of the choice of S1, it
12 can only be the elements prior to that.

13 Q. Let's move now to slide 53 and discuss elements
14 15d and 23d. Does the Nakamura combination disclose the
15 highlighted portion of these common elements on slide 53?

16 A. Yes, it does. This requires comparison of the
17 first candidate to the subset elements. And, as you recall,
18 the first candidate is S1. The subset is S0. In proposal 1
19 on the table on the right you can see towards the bottom the
20 number of times a comparison in the removal process, you can
21 see that there is a comparison of S0 versus S1. Therefore,
22 this portion of the element is satisfied.

23 Q. Let's move to slide 54 and talk about the latter
24 portion of 15d and 23d, the without making a comparison of
25 everything component.

1 In your opinion, does the Nakamura combination
2 disclose the highlighted portion of 15d and 23d on this
3 slide?

4 A. Yes, it does. And this is the alleged point of
5 novelty, according to the applicants, of the '714 patent.
6 In particular, it requires that you do comparisons but you
7 don't compare every pair of elements in a set.

8 And you can see that in Nakamura, you only
9 compare S0 versus S1, whereas the number of comparisons you
10 would have had if you did comparison of every pair would
11 have been ten for the reasons that we heard several times
12 this week during different people's testimony.

13 Q. Let's move to slide 54. Excuse me, we were on
14 54. Let's move to 55 and talk about elements 15e and 23e.

15 Does the Nakamura combination disclose the
16 determine to include or exclude operation that is on this
17 slide?

18 A. Yeah. Based on the comparison, if the motion
19 vectors are the same as described, for example, on the
20 bottom, if you have the same motion information, then you do
21 not include S1, which is the selected candidate. And you
22 would exclude it or remove it from the list.

23 Q. Let's go to slide 56. I want to transition back
24 to the '714 patent for a second.

25 Can you remind us whether the '714 patent

1 discusses removing candidates from a motion vector
2 prediction list?

3 A. Yeah, it does. It describes both including them,
4 inserting them, as well as removing them. You can see here
5 in the background section, after the list is generated,
6 identical motion vectors are removed. And the same thing in
7 the summary of the invention. It describes removal of
8 redundant candidates from the list.

9 Q. And are these disclosures of the '714 patent
10 consistent with the teachings in Nakamura?

11 A. They are.

12 Q. And yesterday were you present for Dr. Moulin's
13 testimony?

14 A. I was.

15 Q. Was there anything that he said about removing
16 motion vector prediction candidates that supports your
17 opinions?

18 A. Yes, my recollection is he referred to the
19 importance of the removal from the candidate list.

20 Q. Let's move to slide 57 and discuss the last
21 element of claim 15, which is 15f. Does the Nakamura
22 combination disclose this element in your opinion?

23 A. It does. You can see that this element requires
24 we have already identified the candidate that we would like
25 to signal to the decoder. What this one is requiring is

1 that the identified candidate is now going to be transmitted
2 and Nakamura describes it, the candidate merge index. This
3 is also disclosed in WD4, which has the merging candidate
4 index in the syntax of this transmitted as part of the
5 bitstream which I have highlighted as merge_idx. And that
6 is being sent and transmitted to the decoder.

7 Q. Let's now move to slide 58 and talk about the
8 final limitation or element in claim 23, 23f. Does Nakamura
9 and the Nakamura combination disclose this claim element?

10 A. Yeah. So this is the element that does exactly
11 the reverse on the decoder side that you actually select the
12 candidate that was identified and received by the decoder
13 after being transmitted by the encoder, and, again, this is
14 the same syntax, WD40 -- WD4, merge_idx has been transmitted
15 to the encoder, and now it's being received by the decoder
16 and the decoder is now going to use it as an argument in the
17 function merge candidate list to identify the specific
18 selected candidate as required by this limitation.

19 Q. Let's move now to slide 59. Can you briefly
20 summarize your opinions on obviousness with respect to the
21 Nakamura combination?

22 A. Yeah. In my view, the Nakamura combination
23 discloses each and every element of claims 15 and 23 and,
24 therefore, renders those claims obvious.

25 Q. Now, when you, in coming to your opinions on

1 obviousness, did you consider Nokia's alleged secondary
2 considerations?

3 A. I did.

4 Q. And did you form any opinions on those?

5 A. I did.

6 Q. And with respect to slide 60, which we're on now,
7 what are your opinions regarding Nokia's alleged secondary
8 considerations?

9 A. So, first of all, Nokia pointed out the sales of
10 the accused products, but I haven't seen any evidence
11 connecting the sales to the actual '714 patent.

12 Secondly, long-felt need, to the extent that
13 there was a long-felt need, the idea of proving down the
14 number of comparisons as we saw has already been proposed by
15 Nakamura.

16 Finally -- I mean, in addition, the idea of
17 praise, I just haven't seen any evidence of praise for the
18 '714 patent. And the fact that the proposal behind '714
19 patent was ultimately adopted by HEVC, there are thousands
20 of proposals submitted and adopted for various
21 considerations in various tradeoffs that are balanced by the
22 committee.

23 Q. Let me follow up on that final point that you
24 just made for a moment. If a proposal is adopted into a
25 standard, does that mean the proposal was technically

1 stronger or better than other proposals?

2 A. Not necessarily. Sometimes it is. Sometimes it
3 is weaker. But it has some advantage for one portion or the
4 other. In this case, the issue is speed that it provides at
5 the expense of slight improvement in compression.

6 Q. Let's move now to slide 61 and address the final
7 invalidity topic in your slides. Were you asked to analyze
8 whether the elements of claims 23 and 15 were well-known,
9 routine, and conventional?

10 A. I was.

11 Q. What did you conclude?

12 A. That in my view, the elements, as well as their
13 ordered combination, are well-known, routine, and
14 conventional.

15 Q. We discussed this previously but in your view,
16 what did the applicant consider novel or inventive about the
17 '714 patent?

18 A. So the applicant focused on the reduction of the
19 number of comparisons as being the main point of novelty.

20 Q. In your opinion, is performing fewer comparisons
21 than what had been previously compared an inventive concept?

22 A. Not in my view. And the reason for it is, first
23 of all, if it was inventive, it was invented by Nakamura.
24 Secondly, the idea of just pruning down the number of
25 comparisons to be slightly -- to perform the operation

1 slightly faster is something that is done throughout. We
2 even do it ourselves when we go shopping and we are looking
3 for apples is one example.

4 You want to get the best apple, but it might take
5 a lot of comparison if you want to compare each and every
6 pair. You might compare a few here and a few there and
7 choose the best. Essentially that's what the alleged
8 invention is about.

9 Q. In your opinion, is performing fewer comparisons
10 than what had previously been compared an improvement in
11 video coding?

12 A. I don't view it as an improvement to video
13 coding. And the reason for it is because it is a slight
14 tradeoff between -- a slight gain in terms of speed at the
15 expense of compression. And that's not something that I
16 would characterize as an improvement of video coding.

17 Q. Do you understand that Nokia takes the position
18 that determining the subset based on location was not
19 well-known, routine, and conventional?

20 A. I do. I have heard that argument, yes.

21 Q. What is your response?

22 A. In my opinion, determining a subset is something
23 that is done throughout. We do it in many different
24 applications. I don't see any potential inventive step or
25 novelty in that portion.

1 Q. Let's now discuss the '267 patent. And on slide
2 63, what are we seeing?

3 A. So that is the front page of the '267 patent.
4 And you can see the title, some of the inventors,
5 Mr. Lainema again, and the priority date on the bottom from
6 January 7th, 2011.

7 Q. Do you have a shorthand that you use for this
8 patent?

9 A. Yeah. I refer to this patent loosely as delaying
10 rounding patent.

11 Q. If we move to slide 64, what is your
12 understanding of the '267 patent subject matter?

13 A. So the focus of the '267 patent is on the
14 rounding errors and the degradation that they could cause
15 especially as it propagates.

16 Q. What is the purported solution that the '267
17 patent provides?

18 A. The '267 patent is focused on postponing the
19 reduction of precision. And so, in particular, the idea is
20 to maintain higher precision as long as possible and only
21 reduce it at the end. Because the '267 patent is focused on
22 weighted prediction, it delays the reduction of precision
23 until after the combination of the two weighted predictions.

24 Q. And is there a figure in the '267 patent that
25 describes the prior art approach to doing bidirectional

1 prediction?

2 A. There is. It's Figure 10 of the patent.

3 Q. Let's move to slide 65.

4 I am going to do a click here. There is going to
5 be a little bit of an animation. And can you walk us
6 through the colors and what we're seeing with respect to
7 Figure 10?

8 A. Sure. This is the prior art weighted prediction.
9 It has been around for a very long time, since early '90s.
10 And the basic idea behind it, you can see in red it is the
11 first prediction. It's a filter that provides some
12 coefficients.

13 And then there is in the prior art a reduction of
14 the precision back to the bit depth of the input that is
15 shown in blue. And that is achieved through a shift to the
16 input level.

17 And then, finally, the combination through green
18 addition. And then, again, a reduction back to the original
19 bit depth of N that is shown in orange on the right-hand
20 side.

21 Q. And you mentioned this was a prior art approach.
22 I just want to confirm, were each and every one of these
23 steps and elements known in the prior art before the '267
24 patent?

25 A. Yeah. This has been known for at least 20 years

1 before.

2 Q. Let's transition now to slide 66. And what are
3 we seeing on slide 66?

4 A. So this is the alleged invention of the '267
5 patent. And I have just simply highlighted some of the
6 differences between the two figures, Figure 10 and Figure
7 11.

8 Q. Can you -- let's start with the gray. Can you
9 address the Gray differences that are highlighted here?

10 A. So there are two things in gray. On the left
11 side you see the P as opposed to N. In the previous figure,
12 that is just a label difference between the two filters.
13 There is no impact of that particular choice.

14 And then on the right side in Figure 11 it does
15 not say signalled in a bitstream which does say it in Figure
16 10. And that's part of the teaching of the '267 patent but
17 not one that is part of the asserted claims. And,
18 therefore, it has no relevance to the issues in this case.

19 Q. Let's focus now on the yellow. Can you explain
20 what is highlighted in yellow?

21 A. Yeah. Before in Figure 10, the shift in yellow
22 was replaced by shift to the original bit depth, prior to
23 the input on the left-hand side; whereas now, the shift is
24 to a number M, which is higher. And, therefore, you get
25 higher precision. And because you get higher precision,

1 that will have presumably a positive impact on the precision
2 of the final result.

3 Q. And like we did with Figure 10, I am going to
4 click. There is another animation.

5 Can you briefly walk us through how bidirectional
6 prediction works with Figure 11 as compared to Figure 10?

7 A. Sure. So you can see here on the left we have
8 first prediction, just like before in Figure 10. The
9 difference between Figure 10 and Figure 11 is this time we
10 have a shift but we only shift to the value M, which is
11 higher than the value N that was done in Figure 10.

12 And then the combination is just like in Figure
13 10 of the two predictions. And then, finally, a shift back
14 to the original bit depth at the very end, just like in
15 Figure 10.

16 Q. Now, were you here in Court yesterday when Dr.
17 Moulin described the '267 patent as a significant
18 contribution that dealt with rounding errors?

19 A. That's my recollection.

20 Q. Do you agree with his testimony?

21 A. I do not.

22 Q. How did Nokia describe the '267 patent in its
23 JCTVC submissions?

24 A. So Nokia in their proposal when they submitted
25 it, they described it as a minor fix.

1 Q. And if we go to slide 67, are we seeing the JCTVC
2 submission that you just alluded to?

3 A. We are.

4 Q. And what about that submission did you find
5 significant and rely on in coming to your opinions in this
6 case?

7 A. You can see up on top it says that this
8 submission, this proposal is very similar to another
9 proposal by Qualcomm, an earlier proposal. And the
10 conclusion is that the contribution of the proposal is a
11 minor fix achieved by rounding after the bi-prediction
12 signals have already been added. And, therefore, delaying
13 the precision reduction.

14 Q. Do you recall how Nokia's inventor described the
15 '267 patent at his deposition in this case?

16 A. Yeah. He essentially agreed with his
17 representation in the proposal as being a minor fix. And
18 addressed it as being a small software change.

19 Q. So let's go to slide 68. Is this the testimony
20 you were just referring to?

21 A. That's correct.

22 Q. And what is your take on all of this? Do you
23 agree that the '267 patent is a minor fix and a small
24 software change?

25 A. I do. I think that's a fair characterization of

1 it. The idea of delaying precision until the end for more
2 accurate results has been known in signal processing for
3 decades. It's not a new idea. It's not a novel idea. And
4 it has a small tradeoff again between slightly better
5 precision at the cost of bigger registers, which are costly.

6 Q. Let's move now to slide 69 and switch topics
7 slightly. Let's talk about the term precision.

8 How do you understand that term as it is used in
9 the '267 patent?

10 A. So the '267 patent uses the term "precision"
11 pretty broadly, but it at least includes a number of bits
12 needed to represent possible values. That's made clear by
13 dependent claims 12 and 30, which specifically require that
14 the precision indicate the number of bits needed to
15 represent the values.

16 And it is also echoed in the specification
17 itself, which gives a particular number of bits, referring
18 to the precision as N bits or referring to the precision as
19 8 bits. And that's also the inventor testimony, Mr. Lainema
20 agreed with this when he refers to the fact that this is,
21 indeed, one example of precision.

22 Q. And before the '267 patent, did the prior art
23 teach any benefits to doing image processing at a higher
24 precision?

25 A. Yeah. Doing image processing at a higher

1 precision and only reducing the precision when you need to
2 at the very end is always advantageous. It is a well-known
3 rule and practical rule that is always adopted in routine
4 signal processing applications.

5 Q. Can we go to slide 70. What is being illustrated
6 on this slide?

7 A. So this is a patent by Demos and a publication by
8 Srinivasan, which say exactly the same thing. In the case
9 of Demos, he talks about the fact that preserving the number
10 of bits during processing and only reducing them at the end
11 is advantageous. Srinivasan echoes the same ideas.
12 Additional accuracy, as he says, obtained by remaining at
13 higher precision until after filtering. So these are
14 routine principles of signal processing design that have
15 been known for a very long time.

16 Q. Do both of these references predate the '267
17 patent?

18 A. Yes, they do.

19 Q. And did you list others with similar teachings in
20 the footnote to this slide?

21 A. I did. It appears throughout the literature.

22 Q. And does this concept of higher precision leading
23 to more accurate results, is this just something that's
24 limited to video coding or does it have other applications?

25 A. No. It's a well-known mathematical principle,

1 really. And it applies to many different applications, not
2 just signal processing.

3 Q. Did you prepare an illustration as to how it
4 could apply elsewhere?

5 A. I did.

6 Q. Let's go to slide 70. Can you just briefly
7 explain this illustration?

8 A. Sure. So you can see here we have a rounding
9 operation. And in this case, it is the addition of 2.4 plus
10 2.4. We would like to get 4.8, but we are going to round.
11 So if you round early, so you take round 2.4 plus round 2.4,
12 the rounding operation will give you 2. So the end result
13 is 2 plus 2, which gives you the value 4.

14 If you round later after -- and delay the
15 rounding until after addition, you are taking round of 2.4
16 plus 2.4, which is equal to the round of 4.8, which gives
17 you the value 5. And as you can see, rounding later is
18 advantageous because 5 is closer to 4.8 than 4.

19 Q. Let's switch topics and talk about the asserted
20 claims. On slide 72, what is your understanding of the
21 asserted claims?

22 A. So these are, again, two apparatus -- I mean,
23 apparatus claims, two independent claims, and four dependent
24 claims, three each for the encoding and decoding claims
25 respectively. As you can see, I have again color coded

1 corresponding limitations which address the same issues from
2 the encoder and decoder perspective.

3 Q. And like we did with the '714 patent, let's move
4 to slide 73 and use decoding claim 25 as an example. Can
5 you just give us a brief walkthrough of this claim?

6 A. Sure. So you can see beginning with 25b, we have
7 to determine the current, first and second reference blocks,
8 and they have to be with a first precision. Those would be
9 the inputs to what is described in Figure 11 from the left
10 side.

11 And they would all have to have the same
12 precision. And in 25c -- and 25d you will use them to
13 obtain the prediction and that would be -- and that
14 prediction would have a second precision that is higher.
15 And as you can see, that would be the output right before
16 the addition. And the precision would be second precision
17 M, which is bigger than N. N corresponding to the precision
18 of the input.

19 Then you would obtain the combined prediction
20 based on the first and second predictions. That's the
21 addition step in this embodiment of Figure 11. Finally, you
22 would decrease the precision of the combined prediction by
23 shifting the bits to the right. And that would be the very
24 right-hand side shifting the bit depth back to N. That
25 would be element 25f.

1 And, finally, 25g is the reconstruction step.
2 That is not depicted in Figure 11. That is just taking the
3 resulting combined prediction and adding it to something
4 known as a residual. And that gives you the reconstructed
5 frame.

6 Q. Let's move to slide 74. What is your
7 understanding of the accused portions of H.265?

8 A. So the accused portions are segments of the H.265
9 standard relating to the combined -- to the weighted
10 prediction. And, in particular, I have shown here the
11 default weighted sample prediction process. There is
12 another one that is very similar called the explicit
13 weighted sample prediction process.

14 I will treat them in the same way. The opinions
15 I have are exactly the same for both of them. And as you
16 can see in this case, the combination is a predSampleL0 plus
17 predSampleL1. That would be the combined prediction.

18 That goes through something that you can see is
19 shifted to the right with shift2 with those two carets. The
20 way that the two carets normally are just the normal shift
21 or what we call a logical shift, in the case of the H.265
22 it's a little different. H.265 defines those two carets as
23 being the arithmetic shift.

24 And the arithmetic shift is described in the
25 H.265 standard, means that the most significant bit, MSB,

1 remains fixed. It remains unchanged. And then, finally,
2 the result of all of this goes through a function called
3 Clip3. And Clip3 simply takes the saturation points above
4 and below a value, it will just cut it off into a particular
5 value, Y and Z, and that will be the output of the Clip3
6 operation.

7 Q. Let's move now to slide 75.

8 Let's talk about AV1, the other accused standard.

9 What is your understanding of the accused
10 portions of AV1?

11 A. So in the case of AV1, again, it is talking about
12 the combined prediction. This time there are many different
13 options. I have shown here one of them called compound
14 distance. There are at least two others, including mask
15 combination, but the opinion I provide is the same for all
16 three of them so I focus on the compound_distance example.

17 And as you can see, the combination is obtained
18 by a weight, forward weight times a preds0, plus backward
19 weight times preds1. And the result of that goes through
20 another function called round2. And the result of that goes
21 through a function Clip1.

22 Round2 is a mathematical function. You can see
23 it is defined as $X \text{ plus } 2 \text{ to the } N \text{ minus } 1, \text{ divided by } 2 \text{ to}$
24 $\text{the } N$. You then can see brackets with only a portion on the
25 bottom.

1 We call it a floor operation. It simply means
2 the greatest integer less than or equal to what's inside the
3 brackets.

4 The Clip1 operation is essentially the same as a
5 Clip operation we just described for the H.265 standard
6 where you just simply cut off the saturation points.

7 Q. Let's transition now to non-infringement. And on
8 slide 77, are these your non-infringement opinions as they
9 relate to claim 25?

10 A. They are.

11 Q. What is your first non-infringement opinion?

12 A. So the first one is that there is a requirement
13 to decrease the precision of the combined prediction by
14 shifting bits to the right, shifting bits of the combined
15 prediction to the right and that's not satisfied in either
16 H.265 or AV1.

17 Q. Let's move to slide 79 and let's talk about H.265
18 first.

19 Can you explain why it is your opinion that H.265
20 does not meet element 25f?

21 A. So I already described at a high level the fact
22 that the H.265 standard relies on arithmetic shift and not a
23 logical shift that's defined on the very bottom, where as
24 you can see, the most significant bit is simply copied. It
25 doesn't change. It remains fixed.

1 And, as a result of this, you cannot change
2 precision using arithmetic shift as required by the claim
3 limitation.

4 Q. Did you prepare an illustration of the
5 differences between a logical right shift and an arithmetic
6 right shift?

7 A. Yeah. In particular, my presentation is
8 comparison of the fact that you can change precision by a
9 logical shift, but you cannot change precision by arithmetic
10 shift. And I have provided an illustration of that.

11 Q. Okay. Let's go to slide 80 and you tell me when
12 to click and can you walk us through this illustration?

13 A. Okay. So this is an important point. So I have
14 tried to illustrate it in some detail. There are two bit
15 strings that are the same on both sides. That will be my
16 starting point.

17 You can see the string of bits, 10110011. And I
18 have indicated the least significant bit, LSB on the right,
19 and most significant bit, MSB on the left. That determines
20 the precision of that particular representation.

21 And now if you click once, we're doing a logical
22 shift on the left. And the logical shift does not require a
23 change in precision but you can change the precision as I
24 have shown over here on the left. And then, in particular,
25 you can see that everything is shifted -- everything is

1 shifted to the right. The most significant bit now is one
2 lower so the precision dropped down by one. If you repeat
3 it, and you shift again, once again the precision will drop
4 down once again.

5 When it comes to the arithmetic shift, the
6 arithmetic shift is designed to represent assigned numbers.
7 So it is very important that the most significant bit
8 remains the same and not change. That tells you if it is
9 positive or negative, if it is 1, it is negative. If it is
10 zero, it is positive.

11 When you're looking at this now, you click once.
12 You can see everything is shifted except for the most
13 significant bit. That must remain anchored at that position
14 or else the machine is unable to understand what the meaning
15 of that number is.

16 So though we have a shift of all the numbers
17 except for the first one, the resulting precision remains
18 unchanged. The most significant bit remains stationary.
19 And if you repeat it once again, that process will repeat.
20 You have a shift of everything else, except for the most
21 significant bit on the far left.

22 The precision remains exactly the same. And you
23 cannot change the precision in this way because the computer
24 must look at that particular bit to know if it is looking at
25 the positive or negative value.

1 Q. Let's move to slide 80 and talk about AV1 for a
2 moment.

3 Can you explain why it is your opinion that AV1
4 does not meet element 25f?

5 A. Sure. So if you look at Nokia's opinion as to
6 what the combined prediction is, the combined prediction I
7 have highlighted here in purple. That's the forward times
8 prediction plus backward times prediction. That goes
9 through an operation of round2. The claim element requires
10 that that be shifted but round2 is not a shifting operation.

11 So that claim element is not met. In fact,
12 round2 is defined as a separate operation altogether of X
13 plus 2 to the N minus 1 divided by 2 to the N, with a floor
14 operation which is not a shift operation. So the AV1 cannot
15 be accused of this even remotely. There is only one portion
16 on the bottom that Nokia points to that has a shift.

17 Q. And how is Nokia arguing that that bottom
18 portion, that's on slide 81, meets 25f?

19 A. So that bottom portion is part of the AV1
20 specification but is just a suggested of a possible
21 embodiment. It doesn't have to be carried out by the
22 decoder, of implementing a round2, if you want to implement
23 it on an integer processing machine.

24 So in that case, what it shows is that the
25 operation of round2 can be implemented as return, you can

1 see it on the very bottom line, return of X plus, and then
2 there is an operation, 1, left shift, N minus 1, right shift
3 N.

4 And this is not met either, even if it were to be
5 implemented in an accused product using this equation, which
6 Nokia has not argued it is, but even if it were implemented
7 exactly like this description, it still would not be
8 satisfied because, as you can see, what is in purple and
9 what goes into the argument of round2 is what is shown in
10 purple, which is X highlighted on the right-hand side of
11 round2 and X highlighted in the return function.

12 X does not undergo right shifting. The only
13 thing that is right shifted is something that occurs much
14 later after you add onto it the value 1, left shifted and
15 minus 1 times. And so this is not met for two reasons.

16 Round2 is not a shift. The implementation that
17 is provided by AV1 is a possible embodiment -- is not an
18 embodiment in any accused product, according to Nokia's
19 analysis. They have not shown that.

20 And even if it were, it wouldn't be a shift of
21 the combined prediction. It would be a shift of something
22 else altogether.

23 Q. You mentioned in your last answer that you saw --
24 you mentioned the vendor implementations. Did you review
25 the code from the third-party chipset vendors and software

1 Codecs that Dr. Moulin pointed to as part of his testimony
2 yesterday?

3 A. I did, yes.

4 MR. HOUMAND: And, Your Honor, at this point, for
5 the next four slides, I would ask that we go on the
6 confidential record because of third-party CBI.

7 JUDGE ELLIOT: Well, actually it's about time to
8 break for the day. Would this be a good time to break?

9 MR. HOUMAND: Yes, it would.

10 JUDGE ELLIOT: All right. Very good. So,
11 Dr. Schonfeld, please don't discuss your testimony with
12 anyone overnight. You can talk about other things but not
13 about your testimony.

14 THE WITNESS: I will do that, Your Honor.

15 JUDGE ELLIOT: And as usual, if anything happens
16 overnight, please bring it to my attention tomorrow morning.

17 (Whereupon, at 4:46 p.m., the hearing recessed,
18 to reconvene at 9:00 a.m. on Thursday, September 12, 2024.)

19

20

21

22

23

24

25

1 C O N T E N T S

2

3 WITNESS DIRECT CROSS REDIRECT RECROSS STAFF

4 ELI SABER 1031 1050 1081

5 JAMES STORER 1086 1190 1247

6 1180 1212

7 DAN SCHONFELD 1249

8

9 AFTERNOON SESSION: 1166

10

11 CONFIDENTIAL SESSIONS

12 1048 - 1049

13 1176 - 1189

14 1219 - 1241

15 1262 - 1263

16 1269 - 1269

17

18

19

20

21

22

23

24

25

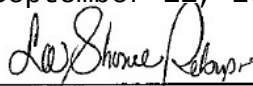
Heritage Reporting Corporation
(202) 628-4888

1 CERTIFICATE OF REPORTER
2 TITLE: Certain Video Capable Electronic Devices
3 INVESTIGATION NO: 337-TA-1380
4 HEARING DATE: September 11, 2024
5 LOCATION: Courtroom A
6 NATURE OF HEARING: Evidentiary Hearing

7 I hereby certify that the foregoing/attached
8 transcript is a true, correct and complete record of the
9 above-referenced proceedings of the U.S. International
Trade Commission.

9 Date: September 11, 2024

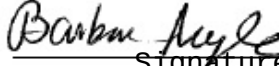
10 SIGNED:



11 Signature of the Contractor of the
12 Authorized Contractor's Representative
12 1220 L Street, N.W., Suite 206
13 Washington, D.C. 20005

14 I hereby certify that I am not the Court Reporter
15 and that I have proofread the above-referenced transcript
16 of the proceedings of the U.S. International Trade
17 Commission, against the aforementioned Court Reporter's
18 notes and recordings, for accuracy in transcription in the
19 spelling, hyphenation, punctuation and speaker
20 identification and did not make any changes of a
21 substantive nature. The foregoing/attached transcript is a
22 true, correct and complete transcription of the
23 proceedings.

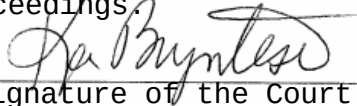
19 SIGNED:



Signature of Proofreader

20 I hereby certify that I reported the above-referenced
21 proceedings of the U.S. International Trade Commission and
22 caused to be prepared from my tapes and notes of the
23 proceedings a true, correct and complete verbatim recording
24 of the proceedings.

23 SIGNED:



Signature of the Court Reporter

25

Heritage Reporting Corporation
(202) 628-4888

UNITED STATES INTERNATIONAL TRADE COMMISSION

In the Matter of:	)	Investigation No.
CERTAIN VIDEO CAPABLE ELECTRONIC	)	337-TA-1380
DEVICES, INCLUDING COMPUTERS,	)	
STREAMING DEVICES, TELEVISIONS,	)	
AND COMPONENTS AND	)	
MODULES THEREOF	)	

OPEN SESSIONS

Pages: 1309 through 1591 (with excerpts)
Place: Washington, D.C.
Date: September 12, 2024

HERITAGE REPORTING CORPORATION

Official Reporters
1220 L Street, N.W., Suite 206
Washington, D.C. 20005
(202) 628-4888
contracts@hrccourtreporters.com

1 UNITED STATES INTERNATIONAL TRADE COMMISSION
2 Washington, D.C.
3 BEFORE THE HONORABLE CAMERON R. ELLIOT
4 Administrative Law Judge
5 _____

6 In the Matter of:) Investigation No.
7 CERTAIN VIDEO CAPABLE ELECTRONIC) 337-TA-1380
8 DEVICES, INCLUDING COMPUTERS,)
9 STREAMING DEVICES, TELEVISIONS,)
10 AND COMPONENTS AND)
11 MODULES THEREOF)
12 _____

13
14 International Trade Commission
15 500 E Street, S.W.
16 Washington, D.C.
17

18 Wednesday, September 11, 2024
19

20 EVIDENTIARY HEARING - VOLUME III
21

22 The Hearing commenced in Courtroom A, pursuant to the
23 notice of the Judge, at 9:00 a.m. Eastern.
24

25 Reported by: Karen Brynteson, FAPR, RMR, CRR

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES:

2

3 For Complainants Nokia Technologies Oy and Nokia
4 Corporation:

5 ADAM D. SWAIN, ESQ.

6 Alston & Bird LLP

7 950 F Street, N.W.

8 Washington, D.C. 20004

9

10 JOHN D. HAYNES, ESQ.

11 NICHOLAS T. TSUI, ESQ.

12 MARK A. McCARTY, ESQ.

13 DAVID S. FRIST, ESQ.

14 Alston & Bird LLP

15 1201 West Peachtree Street

16 Atlanta, GA 30309

17

18 THEODORE STEVENSON, ESQ.

19 Alston & Bird LLP

20 2200 Ross Avenue, Suite 2300

21 Dallas, TX 75201

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 For Complainants Nokia Technologies Oy and Nokia
3 Corporation:

4 JENNIFER D. CIELUCH, ESQ.

5 Alston & Bird LLP

6 90 Park Avenue

7 New York, New York 10016

8

9 WARREN LIPSCHITZ, ESQ.

10 SAM MOORE, ESQ.

11 ERIK B. FOUNTAIN, ESQ.

12 McKool Smith PC

13 300 Crescent Court, Suite 1200

14 Dallas, TX 75201

15

16 R. MITCH VERBONCOEUR, ESQ.

17 JOSHUA J. NEWCOMER, ESQ.

18 McKool Smith PC

19 303 Colorado Street, Suite 2100

20 Austin, TX 78701

21

22 LAUREN SIMENAUER, ESQ.

23 McKool Smith

24 1999 K Street, N.W., Suite 600

25 Washington, DC 20006

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent Amazon.com, Inc. and
3 Amazon.com Services LLC:

4 THOMAS N. MILLIKAN, ESQ.

5 KYLE CANAVERA, ESQ.

6 Perkins Coie LLP

7 11452 El Camino Real, Suite 300

8 San Diego, CA 92130

9

10 VERONICA S. ASCARRUNZ, ESQ.

11 EMILY RICH, ESQ.

12 Perkins Coie LLP

13 700 13th Street, N.W., Suite 800

14 Washington, D.C. 20005

15

16 STEFANI E. SHANBERG, ESQ.

17 ROBIN L. BREWER, ESQ.

18 KARL JOHNSTON, ESQ.

19 Perkins Coie LLP

20 505 Howard Street, Suite 1000

21 San Francisco, CA 94105

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent Amazon.com, Inc. and
3 Amazon.com Services LLC:

4 ANDREW KLEIN, ESQ.

5 Perkins Coie LLP

6 3150 Porter Drive

7 Palo Alto, CA 94304

8

9

10 MARTIN R. BADER, ESQ.

11 RYAN CUNNINGHAM, ESQ.

12 Sheppard, Mullin, Richter & Hampton LLP

13 12275 El Camino Real, Suite 100

14 San Diego, CA 92130

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 STEPHANIE L. ROBERTS, ESQ.

4 Morgan, Lewis & Bockius, LLP

5 1111 Pennsylvania Avenue, N.W.

6 Washington, D.C. 20004

7

8 JASON E. GETTLEMAN, ESQ.

9 COREY R. HOUMAND, ESQ.

10 Morgan, Lewis & Bockius, LLP

11 1400 Page Mill Road

12 Palo Alto, CA 94304

13

14 DAVID J. LEVY, ESQ.

15 RICK L. RAMBO, ESQ.

16 THOMAS R. DAVIS, ESQ.

17 Morgan, Lewis & Bockius, LLP

18 1000 Louisiana Street, Suite 4000

19 Houston, TX 77002

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 BRENT A. HAWKINS, ESQ.

4 Morgan, Lewis & Bockus, LLP

5 One Market Spear Street Tower, 28th Floor

6 San Francisco, CA 94015

7

8 ZACHARY D. MILLER, ESQ.

9 Morgan, Lewis & Bockus, LLP

10 110 North Wacker Drive

11 Chicago, IL 60606

12

13 MATTHEW J. RIZZOLO, ESQ.

14 RYAN BRUNNER, ESQ.

15 Ropes & Gray LLP

16 2099 Pennsylvania Avenue, N.W.

17 Washington, D.C. 20006

18

19 KEVIN J. POST, ESQ.

20 LANCE W. SHAPIRO, ESQ.

21 Ropes & Gray LLP

22 1211 Avenue of the Americas

23 New York, New York 10036

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 SHONG YIN, ESQ.

4 Ropes & Gray LLP

5 1900 University Avenue, 6th Floor

6 East Palo Alto, CA 94303

7

8 For the Office of Unfair Import Investigations:

9 MARISSA DUCCA, ESQ.

10 JEFFREY HSU, ESQ.

11 U.S. International Trade Commission

12 500 E Street, S.W.

13 Washington, D.C. 20436

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 P R O C E E D I N G S

2 (9:00 a.m.)

3 JUDGE ELLIOT: Good morning. Have a seat,
4 please.

5 We're here in the matter of Certain Video Capable
6 Electronic Devices, Including Computers, Streaming Devices,
7 Televisions, and Components and Modules Thereof, United
8 States International Trade Commission Investigation No.
9 337-TA-1380.

10 My name is Cameron Elliot, Presiding
11 Administrative Law Judge. May I have appearances from
12 counsel, please.

13 MR. SWAIN: Good morning, Your Honor. Adam Swain
14 from Alston & Bird on behalf of the Complainants, Nokia.
15 Also, McKool Smith will be presenting today.

16 MR. HOUMAND: Good morning, Your Honor. Corey
17 Houmand from Morgan Lewis on behalf of Respondents HP, along
18 with my other colleagues who appeared before you this week.

19 MR. CANAVERA: And good morning, Your Honor.
20 Kyle Canavera from Perkins Coie on behalf of Respondent
21 Amazon and the same team as previously, previous days.

22 JUDGE ELLIOT: Good morning. So, all right, I'm
23 going to have to yell.

24 I understand that there's an issue with
25 confidentiality designations. Yes, Mr. Swain?

Heritage Reporting Corporation
(202) 628-4888

1 MR. SWAIN: I hope I bring good news that we've
2 solved the objection, Your Honor. We're no longer seeking
3 to seal that part of the transcript.

4 JUDGE ELLIOT: Oh, okay. Very good. All right.
5 That's good to hear.

6 Any other issues that we need to talk about
7 before we start in again with the witness?

8 MR. SWAIN: No, Your Honor, just to bring you
9 update on timing and witness presentation. Same order for
10 today. Dr. Schonfeld should complete his examination, and
11 then we'll have Dr. Mody, Dr. Simcoe, Mario Lopez, and Brian
12 Napper for the Respondents today. They'll be closing their
13 case. And we expect Dr. Levin from our rebuttal case to be
14 able to finish up today. And that will leave us with the
15 three technical experts for Friday. We expect to be
16 finishing, again, on time shortly after lunch.

17 JUDGE ELLIOT: Very good. Mr. Swain, can you
18 tell me, I'm just curious, is the microphone on the podium
19 on right now?

20 MR. SWAIN: It is not, Your Honor.

21 JUDGE ELLIOT: All right. Anything from
22 Respondents?

23 MR. SWAIN: Oh, actually, one more thing. I
24 apologize.

25 JUDGE ELLIOT: Yes. Go ahead.

1 MR. SWAIN: We did change -- for Friday, we did
2 and we notified Respondents and Staff of this, we tweaked
3 the just order a bit. Dr. Moulin is going to go first on
4 Friday, followed by Dr. Orchard and Dr. Kia. The original
5 order was Dr. Moulin would be last, but now he's going to go
6 first on Friday.

7 JUDGE ELLIOT: Very well.

8 MR. SWAIN: And that's it for Complainants, Your
9 Honor. Thank you.

10 JUDGE ELLIOT: Very well. Anything, Respondents?

11 MR. HOUMAND: Nothing from Respondents, Your
12 Honor.

13 JUDGE ELLIOT: Very well. I'm sorry, I did not
14 ask for the Staff's appearance, and it appears Ms. Ducca is
15 not here.

16 Go ahead, Mr. Bui.

17 MR. BUI: Good morning to you, Your Honor. Vu
18 Bui for the Staff. And joining me this morning is one of
19 our interns, Sophia Zhang.

20 JUDGE ELLIOT: All right. Good morning.

21 Okay. Dr. Schonfeld, let me remind you, you're
22 still under oath.

23 Whereupon--

24 DAN SCHONFELD,
25 having been previously duly sworn/affirmed, was examined and

1 testified as follows:

2 JUDGE ELLIOT: Mr. Houmand?

3 MR. HOUMAND: Yes, Your Honor. And, Your Honor,
4 may I resume the examination?

5 JUDGE ELLIOT: Yes, please.

6 DIRECT EXAMINATION -- Resumed

7 BY MR. HOUMAND:

8 Q. Good morning, Dr. Schonfeld.

9 A. Good morning.

10 Q. Where we left off yesterday, we were about to
11 talk about some vendor code.

12 MR. HOUMAND: And, Your Honor, at this point, I'd
13 ask that we go on the confidential record because of
14 third-party CBI.

15 JUDGE ELLIOT: Very well.

16 (Whereupon, the hearing proceeded in confidential
17 session.)

18

19

20

21

22

23

24

25

1 O P E N S E S S I O N

2 BY MR. HOUMAND:

3 Q. Dr. Schonfeld, what is your second
4 non-infringement opinion for decoding claim 15?

5 A. Yeah. For claim -- claim 15 or 25?

6 Q. Sorry, I misspoke. What is your second
7 non-infringement opinion for decoding claim 25?

8 A. So for claim 25, there was a requirement that the
9 first, second reference blocks, as well as the current
10 block, have the same precision. And Nokia has not shown
11 that.

12 Q. Mr. Sayres, may we have one of Dr. Moulin's
13 demonstratives put on the screen, CDX-12C.50.

14 Dr. Schonfeld, do you recall seeing this slide
15 during Dr. Moulin's testimony?

16 A. I do.

17 Q. For element 25f that's on the screen, did
18 Dr. Moulin identify a first reference block and a second
19 reference block in H.265?

20 A. Yeah. You can see them. It's in the bottom of
21 comment number 1 in brown and -- I'm not sure what color it
22 is, but next to it.

23 Q. And did Dr. Moulin identify the claimed current
24 block?

25 A. No, he did not.

1 Q. Well, if I read this slide correctly, he was
2 pointing to that purple box that says "the decoding process
3 for prediction units." Why isn't that a current block?

4 A. Yeah. If we actually go back to see the full
5 slide, you can see that that is color-coded to correspond to
6 current block, but that's not the block at all. The
7 decoding process is just a process. It's not describing the
8 block. The block that has to be addressed is the residual
9 block and to show that it has the same precision as resIdx
10 and resL1 and that -- Nokia completely ignored that issue.

11 Q. So just to put a point on it, did Dr. Moulin
12 establish that the current block, first reference block, and
13 second reference block as alleged in H.265 are at the
14 claimed first precision?

15 A. No.

16 Q. Mr. Sayres, may we now have CDX-12C.62 from
17 Dr. Moulin's demonstratives.

18 Dr. Schonfeld, do you recall seeing this slide
19 during Dr. Moulin's testimony?

20 A. I do.

21 Q. And this is the portion of the AV1 specification
22 that Dr. Moulin relied on to establish 25b in the accused
23 products.

24 Do you recall that?

25 A. I do.

1 Q. And do you agree that this portion of AV1 meets
2 the claim language?

3 A. No.

4 Q. Why not?

5 A. Well, this portion just simply says that the
6 selected frames have to match the current frame in bit
7 depth. The current frame as used in AV1 is a variable that
8 is continuously updated. From the very beginning, it is
9 updated to obtain the prediction. It is then filtered and
10 ultimately combined with a residual to obtain the final
11 reconstructed frame.

12 And this does not establish any such relation.
13 It just simply says that the reference frame has to be
14 uploaded onto that variable. And, in fact, in AV1, it makes
15 clear that the residual is going to be distinct from that
16 particular variable and has different values, depending on
17 different circumstances, for example, as described on page
18 290 of AV1.

19 Q. Mr. Sayres, may we now go back to slide 89,
20 Dr. Schonfeld's demonstratives.

21 And, Dr. Schonfeld, what are you illustrating
22 here?

23 A. These are the two reasons why I believe claim 25
24 is not satisfied by the accused products. And the reasons
25 are, as I just established, Nokia failed to establish that

1 25b is met. And 25f, the decreasing the precision by shift,
2 is not done in any of the accused products. In fact, we saw
3 that something completely different is done most of the
4 time.

5 Q. Let's move to slide 90. Are these your
6 non-infringement opinions with respect to encoding claim 7?

7 A. That's correct.

8 Q. And is it your understanding that only the HP
9 accused products are alleged to infringe the encoding
10 claims?

11 A. That's my understanding.

12 Q. I believe you already addressed the first
13 non-infringement opinion with respect to your analysis of
14 claim 25; is that right?

15 A. That's right, the decreasing the precision by
16 shift is the same exact opinion I had for claim 25.

17 Q. What is your second non-infringement opinion for
18 encoding claim 7?

19 A. Yeah, there is a requirement that the residual
20 data be obtained based upon the difference between the
21 combined prediction and the block of pixels. And that's not
22 satisfied in the accused products.

23 Q. And if we move to slide 92, can you explain why
24 it's your view that the final element of claim 7, element
25 7g, is not met in the HP accused products?

1 A. Sure. So as you can see here, this is a
2 screenshot from Nokia's report. It shows what is the
3 combined prediction. It's highlighted in yellow on the
4 right. That's the combination of the predictions and the
5 final shift.

6 And as you can see, that variable, combined
7 prediction, is unavailable. And the reason it's
8 unavailable, because it has to undergo another operation,
9 Clip3. Clip3 is that saturation function. It's defined on
10 the bottom left. I spoke about it to some degree yesterday.
11 And that just simply saturates -- if the value is too high,
12 it clips it. If it's too low, it clips it. And, in
13 between, it's unchanged.

14 That means that the combined prediction is
15 inaccessible after you obtain the Clip3 because what you
16 have now is a clipped version of the combined prediction.
17 And, therefore, computation of the residual based on the
18 difference between the clipped combined prediction and the
19 block is not the same as what is required, which is a
20 difference between the combined prediction and the block.

21 Q. How do you respond to the suggestion made by
22 Dr. Moulin that the Clip operation only affects edge cases
23 and very rarely makes a difference?

24 A. So I think you asked me a similar question
25 yesterday. And it's the same response, the clipped

1 operation is still a function. It still changes the values.
2 When it doesn't change the values, it still undergoes that
3 function.

4 The claim limitation requires that you take the
5 difference between the combined prediction and the block.
6 And the combined prediction is no longer accessible. What's
7 accessible is only the clipped function applied to the
8 combined prediction; and, therefore, in my view, this
9 limitation is not satisfied.

10 Q. And just to be clear, for the chipsets used in
11 the HP accused products, did Nokia or Dr. Moulin identify
12 any specific code showing how the residual was determined?

13 A. No. That was -- Nokia ignored that issue
14 completely.

15 Q. Let's move to slide 93.

16 And what is your final non-infringement opinion
17 for encoding claim 7?

18 A. So this is very similar to the opinion that I
19 gave with respect to the encoding claim for the '714 patent.
20 And that is that looking at the VQ Analyzer, which is
21 software looking at the output of the encoder, is
22 insufficient and cannot be used to establish that certain
23 limitations about functionality happening inside the encoder
24 is met. Because you're only looking outside of the encoder,
25 you can only see what the bitstream produced by the encoder

1 is. You cannot look inside the encoder and determine
2 whether the claim limitations are satisfied.

3 Q. So you -- in your answer, you touched on this
4 already, but can you just give us exemplary deficiencies
5 that you viewed after reviewing the VQ Analyzer screenshots
6 that Nokia and Dr. Moulin rely on for claim 7?

7 A. Sure. So you can see that there are the
8 determination step, the decrease step, and code step. All
9 of these require certain functionality that you cannot see
10 from outside, from the VQ analysis.

11 But the most egregious case in my view is the 7c
12 and 7d, which requires that the first and second precision
13 have the same second precision. And that is a second
14 precision that's different from the input precision of the
15 encoder. It's also different from the output precision of
16 the encoder, which means that the only way to establish it
17 is by looking inside the encoder. And, therefore, when
18 you're looking outside of the encoder, it is simply
19 impossible to look and to determine that 7d -- 7c and 7d are
20 satisfied.

21 All Nokia does is it says that the numbers are
22 such that you could find a precision that could accommodate
23 both numbers. They don't actually look and determine what
24 the precision is and that it's the same precision.

25 Q. And on slide 95, is this a list of the elements

1 that in your opinion are not met with respect to claim 7?

2 A. Yes. And they are due to three different reasons
3 that I just mentioned. One, we just discussed, the VQ
4 Analyzer cannot be used to determine any of these
5 limitations. Secondly, the 7f, the same opinion I provided
6 for the decoding, about the shifting reducing the precision
7 that cannot be done with the arithmetic shift, applies to
8 7f. And, finally, 7g because the residual is
9 inaccessible -- cannot access the combined prediction, only
10 the clipped version of the combined prediction.

11 Q. Let's transition now to the topic of invalidity.
12 And moving to slide 96, what prior art did you analyze with
13 respect to the '267 patent?

14 A. That is the Walker prior art.

15 Q. And if we move to slide 97, are we seeing the
16 Walker reference?

17 A. Yeah, this is the Walker reference. You can see
18 it was filed in May of 2005 for Qualcomm.

19 Q. And let's move now to slide 98. What's going on
20 with the equations that we're seeing here?

21 A. So Walker is focused on doing combined prediction
22 for -- having two sources of prediction. And over here on
23 the left in equation 13, you can see doing it for the
24 encoder side. Equation 18 on the right is for the decoder
25 side.

1 And then there are corresponding tables below,
2 Table 2 and 4, for the encoder and decoder respectively,
3 which actually go through and determine the number of bits
4 on a step-by-step basis as one goes through the equation
5 from the beginning to the end.

6 Q. Do Tables 2 and 4 on this slide show a change in
7 precision for the operations within equations 13 and 18?

8 A. Yeah, they do. You can see, for example, in the
9 encoder, you begin with 8 bits and you proceed. From 8
10 bits, you go up to 18 bits at some point and then back down
11 to 8 bits at the output. And, similarly for the decoder,
12 again you begin with 8 bits. This time you go up to 23 bits
13 and, again, at the output, 8 bits.

14 Q. Let's now move to the first common element, 7a
15 and 25a. Does Walker disclose these elements?

16 A. It does.

17 Q. And can you explain how the disclosures on slide
18 99 support your opinion?

19 A. So the element requires a processor and memory as
20 well as computer program code for carrying out the various
21 steps. In paragraph 122 of Walker, there is a description
22 of a general purpose processor, as well as a microprocessor.

23 In paragraph 123, you can see the reference to
24 the RAM memory, as well as flash memory. And that paragraph
25 also talks about the fact that there is a software module

1 executed by a processor, which carries out the various
2 functions that Walker teaches.

3 Q. On slide 100, let's focus on the encoding side
4 first because the equations are a bit different. Does
5 Walker disclose element 7b?

6 A. It does. You can see that element 7b requires a
7 first reference block based on a first motion vector that's
8 highlighted in brown in paragraph 34 on the left. The
9 motion vectors are 525. And you can see on the Figure 5 on
10 the right-hand side it comes from the reference block and is
11 used to determine the best matching macroblock 520.

12 And then correspondingly on the -- in turquoise,
13 second reference block, the same thing in paragraph 34,
14 motion vector 585 is used from the reference block that is
15 shown in Figure 5 to obtain the best matching block, 580.

16 Q. On slide 101, in Walker, are the pixels of the
17 current block, first reference block, and second reference
18 block at a first precision?

19 A. They are. You can see that the current block is
20 mentioned in paragraph 30. It defines 8 bit for luminance
21 and 8 bit for both chrominance elements, so for a total of
22 24 bits of color. And the same thing applies for the
23 reference blocks, which are used for the prediction. Again,
24 24 bit of color. So this element is disclosed by Walker.

25 Q. Let's move to slide 102 and elements 7c and 7d.

1 Let me ask you, does Walker's encoder use the first
2 reference block to obtain a first prediction?

3 A. It does.

4 Q. Can you explain?

5 A. So the first prediction in this case is shown in
6 light brown over here in the equation, equation 13 on the
7 right. And you can see in operation 1 or step 1 of Table 2,
8 that corresponds to pred_0 times W_0 . And that results in
9 going to a second precision, which is 16 bits, which is
10 higher than the original 8 bits.

11 Q. And does Walker's encoder use the second
12 reference block to obtain a second prediction?

13 A. Yeah. That's exactly the same thing. That's
14 shown in turquoise. Pred_1 times W_1 , again going up from 8
15 to 16 bits.

16 Q. Now let's focus on a kind of core dispute between
17 the parties on this invalidity point.

18 Did Nokia and Dr. Moulin agree with you that
19 Walker teaches the first and second predictions?

20 A. They do not.

21 Q. And how do you understand their disagreement?

22 A. Well, if you look at the equation 13, they agree
23 pred_0 and pred_1 are predictions. They say that when you
24 multiply them by the weight, they are not predictions, but
25 when you combine them and add them and clip them, now it's a

1 prediction again, the final prediction. My understanding of
2 Nokia's argument is that weighted prediction is not
3 prediction. And I disagree with that.

4 Q. And if we go to slide 103, can you give us -- can
5 you explain why you disagree?

6 A. Sure. So if you look at dependent claims 10 and
7 28, dependent claims 10 and 28 are very similar. They both
8 look at the case where there is an instance where the motion
9 vector is pointing to an integer, which means that the
10 actual filter in the '267 patent wouldn't do anything. It
11 wouldn't change the precision.

12 The precision is changed because you're shifting.
13 Doing a shift of the variable is the same as multiplying or
14 dividing it by a constant, depending on how you shift. In
15 this case, it's multiplication. And this is described, for
16 example, in Walker on the right side in paragraph 46, which
17 says that bit shifting is the same as scaling by a factor.
18 There are many other references that say the same, like
19 Kirchhoffer, that says left shift is multiplication by 2.

20 So, in summary, the dependent claim specifically
21 requires the prediction encompass the weighted prediction.

22 Q. Let's move to slide 104.

23 And can you -- are there additional reasons why
24 you believe Walker teaches the claimed first and second
25 predictions?

1 A. Yes, I do. And you can see here, this is the --
2 some of the patents in the same family as the '267 patent.
3 And it begins with '693 and goes through '037 and '267. And
4 there were claims addressing the prediction in each of them.
5 And as you can see, they got increasingly broader.

6 Initially, it was first prediction by fractional
7 pixel sample interpolation process. Then in '037, it
8 dropped the requirement for fractional. It was just by
9 interpolation. And by the time you reached the '267, there
10 is no requirement for interpolation or anything. It is just
11 any type of prediction.

12 Q. Now, let me pause here and ask, on the top of
13 this slide we see the '673 parent patent, did you review the
14 prosecution history of that parent patent?

15 A. I did.

16 Q. And if we go to slide 105, is there anything in
17 the prosecution history of that '693 parent that also
18 supports your opinions?

19 A. Yeah. This was an amendment by the applicant in
20 response to a rejection by the examiner. And I separated it
21 in colors because there are two separate parts. First, it's
22 a summary of the examiner's view that a reference by the
23 name of Ye was used by the examiner for rejection. And the
24 reason for it was because, as the examiner made clear, W
25 times P0, the weighted prediction, is a prediction that he

1 used to invalidate and -- to find it anticipated or obvious.
2 And the same thing for P1 times another weight, which is W
3 minus W.

4 And then the -- Nokia in response didn't dispute
5 that the weighted prediction is not a prediction. They
6 simply pointed out that the only thing that changes is the
7 range when you multiply by a weight, unless you actually
8 disclose that you have changed the precision. And that was
9 not done in Ye according to the applicant. And that's the
10 reason why they argued that the claims should be allowed
11 over Ye.

12 Q. Let's go back now to the claim elements and
13 continue walking through 7e and 7f. In your view, are these
14 elements disclosed by Walker?

15 A. They are.

16 Q. Can you explain?

17 A. Sure. If you look at 7e, it requires that you
18 have a combined prediction based on the previous prediction,
19 the first and second prediction. And then in 7f, it
20 requires that you decrease the combined prediction by
21 shifting to the right.

22 Well, in equation 13, the combined prediction is
23 shown in purple. It's preds_0 times W_0 plus pred_1 , W_1 plus
24 the offset. It's shown here as 2 to the $\log W_D$, which the
25 Walker reference makes clear can be written as 2 to the

1 power LWD minus 1, as shown in step 3 of Table 2 below.

2 And then, similarly, the shift to the right is
3 shown in equation 13 by the double carrot with a logWD plus
4 1, which again Walker makes clear the logWD plus 1 is the
5 same as LWD plus 1, shown in step 4 of Table 2 below. And,
6 specifically, the initial predictions, pred0 times W0 and
7 pred1 times W1, were each 16 bits. And by the time the
8 shifting has changed, the resulting precision is now 10 bits
9 lower than the initial precision.

10 Q. Let's move now to slide 107 and the final element
11 of claim 7. Does Walker disclose 7g?

12 A. It does. And you can see it requires encoding of
13 residual data determined by the difference between combined
14 prediction and the block of pixels. And you can see that in
15 paragraph 34, there is a weighted combined bidirectional
16 macroblock which is subtracted from -- the block is
17 subtracted from the weighted combined prediction to obtain
18 the residual error. And, therefore, the residual error is
19 disclosed at least in the manner Nokia interprets this claim
20 limitation.

21 And then, further, this is encoded as described
22 in the bottom of paragraph 34 and then, finally, transmitted
23 over a network in the form of an encoded data stream, and an
24 encoded data stream is just another word for bitstream.

25 Q. Let's now do the decoding side and briefly walk

1 through those elements. With respect to 25b, does Walker
2 teach determining first reference blocks and second
3 reference blocks on the decoding side?

4 A. It does. You can see -- let me begin with Figure
5 5 -- the top portion of Figure 5 is the encoder side. The
6 bottom portion is the decoder side. You can see it makes a
7 loop on the right-hand side.

8 And in paragraph 35, we have the motion vectors
9 525 and 585, the same motion vectors that were used on the
10 encoder side. Now they are used for the decoder to obtain
11 the best matching macroblock 565 and the best matching
12 macroblock 590 from the same reference block, just like
13 described on the encoder side. And, therefore, this
14 limitation or this element is disclosed.

15 Q. Let's go to the latter portion of 25b on slide
16 109. Is the first precision also disclosed by Walker on the
17 decoding side?

18 A. It is, at least under Nokia's interpretation of
19 the claim, where it points to the fact that the luminance
20 and chrominance produced are the same and they are all
21 24-bit color.

22 Q. On slide 110, we have elements 25c and 25d. What
23 is the -- well, let me just ask, does Walker's decoder use
24 the first reference block to obtain a first precision?

25 A. It does. You can see that what we have here, the

1 first prediction is relied on by the first reference block,
2 as shown in the previous figure. And the prediction is
3 pred_0 times WA shifted to the right by 6. The shifting to
4 the right by 6 is just another multiplication or division.
5 And so pred_0 times WA is just another weighted prediction.

6 And as you can see, its precision goes up to --
7 it will become 17 bits as opposed to 8 bits, which it
8 started. And that's for the first prediction. In
9 turquoise, we see the same thing for the second prediction,
10 which is pred_1 times WB shifted to the right by 6, which is
11 also 17 bits.

12 Q. And you gave a series of opinions regarding
13 Walker's predictions as they apply to claim 7. Do those
14 opinions also apply to claim 25?

15 A. Yeah. It's exactly the same opinion for this
16 prediction as well.

17 Q. Let's move to slide 111. We have elements 25e
18 and 25f. Does Walker disclose these elements?

19 A. It does. You can see for 25e, the combined
20 prediction is shown in purple, and that's pred_0 WA shifted
21 to the right by 6 plus the corresponding term for pred_1 ,
22 plus an offset. And that is shown in step 2 of Table 4.

23 And then 25f is shifting that's shown by a two
24 caret and 8 in light blue in equation 18 on the right. And
25 that corresponds to step 3 of Table 4. And that is a

1 reduction in precision going from 17 bits down to 11 bits.

2 Q. Let's move to slide 112.

3 And does Walker disclose element 25g?

4 A. It does. 25g requires reconstruction of the
5 block of pixels based on the combined prediction. And you
6 can see in paragraph 35 you have the residual is added to
7 the combined prediction to form the reconstructed
8 macroblock, which is exactly what's required. And this is
9 -- the same exact sentiments are taught in paragraph 111.
10 And in Figure 8 on the right-hand side, you can see it
11 visually, the original residual error is obtained in block
12 820 and then decoded.

13 The weighted -- the combined prediction is
14 obtained at 870 after shifting. Those two are combined to
15 obtain the reconstruction, which is shown on the right-hand
16 side in block 825.

17 Q. Let's now move on to the dependent claims. And
18 we'll do them together.

19 So on slide 113, we have dependent claims 8 and
20 26. In your opinion, does Walker disclose an instance in
21 which the first motion vector points to a sub-pixel?

22 A. It does. The sub-pixel just means we're looking
23 between the pixels. In paragraph 111, you can see that
24 there is an interpolation of a point, so you can look inside
25 the pixels. In paragraph 114, this is specifically for half

1 pixel representation in this example. Walker also has other
2 teachings of looking at quarter pixels resolution.

3 And in Figure 9 on the right-hand side, you can
4 see the original pixels shown in circles. And then in
5 between the half-pixel resolution obtained, those are the
6 tiny squares that I've highlighted in green. Those are the
7 sub-pixels.

8 Q. Let's move to slide 114. Does Walker disclose
9 the latter portion of claims 8 and 26 in which the first
10 prediction is obtained by interpolation using pixel values
11 of the first reference block?

12 A. Yes, it does. You can see that in paragraph 111.
13 It specifically refers to pixel interpolation as being the
14 mechanism used for it. And in paragraph 114, same thing.
15 It refers to the half-pixel interpolation for the example we
16 just described -- we just saw.

17 And then in Figure 9 in the previous slide, it
18 shows an example of half-pixel interpolation which applies
19 to the encoder and decoder. And then here for the decoder
20 side, we can see Figure 8. It shows an example of how you
21 would do the pixel interpolation in the highlighted block
22 835. And that same approach, you would -- a person of skill
23 would apply the same pixel interpolation on the
24 corresponding encoder itself.

25 Q. And why would a person of skill apply the same

1 interpolation teachings on both the encoding and decoding
2 side as taught by Walker?

3 A. Because one has to make sure that the decoder is
4 looking at the same half-pixel, a motion vector that the
5 encoder actually generated.

6 Q. Moving on to claims 9 and 27, does Walker
7 disclose these elements?

8 A. It does. So -- at least under obviousness, and
9 the reason I say "under obviousness" is because you can see
10 that this requires interpolation. And, furthermore, it
11 requires that the interpolation be obtained by a right shift
12 of a sum of a P-tap filter. And if we look at paragraph
13 114, it has interpolation of half-pixel and it has a P-tap
14 filter, in particular, a 2-tap filter, whose values
15 are .5, .5. But it doesn't have the subsequent right shift
16 afterwards.

17 But the person of ordinary skill would know that
18 a 2-tap filter with coefficients half/half is the same as a
19 2-tap filter with coefficients 1/1, followed by a right
20 shift. It gives the exact same result. It's no different
21 at all.

22 And, therefore, a POSITA would be motivated to do
23 it. And the reason they would be motivated to do it in this
24 way is because when you have two half-pixel -- two half
25 coefficients, you have to actually have a multiplier, so you

1 have to multiply and add and then multiply and add; whereas
2 if you have 1/1, you're just adding. And then the final
3 shift is a very simple operation, much -- much less costly
4 than multiplication, which is just shifting the register.

5 And then, finally, in paragraph 46, it teaches
6 that the shifting is the same thing as multiplication by a
7 constant, such as a scaling factor.

8 Q. If we move to slide 116, can you briefly
9 summarize your obviousness opinions with respect to
10 invalidity based on Walker?

11 A. So in my opinion, each of the asserted claims, 7,
12 8, 9, 25, 26, 27, is either disclosed or suggested by Walker
13 and, therefore, in my opinion, is rendered obvious by
14 Walker.

15 Q. Did you -- in reaching this obviousness opinion,
16 did you consider Nokia's alleged secondary considerations?

17 A. I did.

18 Q. And moving to slide 117, what did your analysis
19 show with regard to the secondary considerations?

20 A. That -- Nokia claims that there is praise for the
21 '267 patent, but I didn't see any evidence of praise.
22 Secondly, the idea of bidirectional prediction is very old.
23 It appears at least in every standard since the early 1990s,
24 1991 or 1993, depending on how you look at the earlier
25 standards. And so this has been around for a very long

1 time. There is nothing new about bidirectional prediction.

2 And to the extent that there was any long-felt
3 need for the decrease of precision later, that was already
4 done by Walker, as I just stepped through and established.

5 Q. Let's move to slide 118, and let me ask you, were
6 you asked to analyze whether the elements of the '267
7 patent's asserted claims were well known, routine, and
8 conventional?

9 A. I was.

10 Q. And what did you conclude?

11 A. In my view, each of the elements individually, as
12 well as their ordered combination, are well known, routine,
13 and conventional.

14 Q. Let me move to slide 119 and ask you, what did
15 the applicant view as novel or inventive about the '267
16 patent?

17 A. So as we saw earlier in the description of the
18 differences between the prior art in Figure 10 and Figure
19 11, which is the alleged invention, the difference is
20 highlighted in yellow, which is only shifting the -- only
21 reducing the precision lightly or changing the precision
22 lightly and only reducing the precision to the input bit
23 depth at the very end, instead of doing it in the middle.

24 Q. In your opinion, is there an inventive concept in
25 maintaining higher precision during bidirectional

1 prediction?

2 A. Not in my view. And the reason I say that is
3 because I already showed that that is a well-known principle
4 that existed for decades in the signal processing community.
5 We saw portions of the demos in Kirchhoffer documents,
6 patents and publications, and there are many others that do
7 the same thing. They shift the reduction of precision until
8 later in order to reduce the effect of roundoff effects. To
9 the extent it was done, it was already done by Walker and
10 the other researchers that I've pointed to through the
11 course of this presentation.

12 Q. And does the concept that you were just
13 describing -- is it limited to just signal processing or
14 does it apply in other fields?

15 A. No. It's a general mathematical concept. It
16 applies throughout. We apply it when we want to add values.
17 When we look at the itemized total, if we do the rounding
18 early, we'll get an imprecise result. If we add precisely
19 and only round at the end, we'll get a more precise result.

20 I already discussed this example in detail
21 yesterday, so I will not repeat it. But you can see that
22 this principle is very, very clear. If you round early, you
23 get 4 instead of 4.8. If you round later, you get 5, which
24 is much closer to 4.8.

25 Q. Do you understand that Nokia takes the position

1 that the '267 patent improves the functionality of video
2 Codecs?

3 A. I do.

4 Q. And do you have a response to that?

5 A. I do.

6 Q. And what is it, sir?

7 A. In my view, there is not a technological
8 breakthrough of any kind here. There is a very mild
9 tradeoff, where you are getting slightly more precise values
10 at the expense of more expensive registers because of the
11 higher precision required. This is not a new concept. It
12 is a well-known concept. And they just simply applied it to
13 the bidirectional prediction that existed for at least 20
14 years before the alleged invention.

15 Q. Let's move now to a different topic, which is
16 your opinions common to both patents. Let's talk about
17 standard essentiality first.

18 Is the '714 patent essential to H.265?

19 A. Not in my view.

20 Q. Why not?

21 A. Well, for one, I show that the standard itself is
22 not required by the accused products.

23 Q. If the '714 patent were found to be essential to
24 H.265, do you have any opinions about the significance of
25 the '714 patent, compared to the overall standard?

1 A. I do. And as I mentioned yesterday, the
2 significance is very minor because you're just sacrificing
3 slight accuracy in terms of having redundancy in the list
4 and, as a result, slightly inferior compression, but what
5 you're gaining is a slight improvement in speed because
6 you're doing less comparisons for the '714 patent.

7 So I think it is a trivial change in terms of the
8 effect on the standard as a whole.

9 Q. Is the '267 patent essential to H.265 or AV1?

10 A. No.

11 Q. Why not?

12 A. For the same reasons as I mentioned for the '714
13 patent and as well I mentioned earlier today, that there is
14 a minor tradeoff between a slight increase in precision
15 because of the later rounding at the expense of more
16 expensive resources, such as greater registers, longer
17 registers that have to be used.

18 Q. Let's now move to technical domestic industry on
19 slide 122. Have you formed any opinions on this topic?

20 A. I have.

21 Q. And what are we seeing on slide 122?

22 A. So we see on the left side, Microsoft DI
23 products, which contain various hardware chipsets for the
24 decoding and encoding functionality, including Intel, AMD,
25 and NVIDIA.

1 On the right-hand side, Samsung DI products,
2 which contain the Android software decoder and encoder. And
3 also Nokia pointed out to some hardware decoder that can be
4 used for 265, but it's not clear what they are pointing to.

5 Q. How do -- at least for the Microsoft DI products,
6 how do those products compare to the accused products?

7 A. They are the same. In -- well, the products are
8 different, but the chipsets underlying for the Codec are the
9 same chipsets.

10 Q. Now, were you in court when there was a
11 suggestion made that there may be a custom chip, a custom
12 AMD chip for the Xbox?

13 A. Yeah, I was in court.

14 Q. Now, based on the code that you've reviewed, have
15 you seen any evidence of what those customizations might be?

16 A. I am not aware of it. I don't know anything
17 about the customized chipsets.

18 Q. And if we move to slide 123, what are your
19 opinions regarding technical domestic industry?

20 A. So, first, Nokia has not actually identified the
21 Microsoft and Samsung domestic industry products. They just
22 refer to them in general. And, secondly, the analysis that
23 they practice the accused products fails in my view for the
24 same reason that they fail for the accused products, because
25 they are the same chipsets or hardware or software decoders.

1 And then, finally, Nokia has not established that
2 there was analysis -- has not analyzed the fact that there
3 was anything other than using off-the-shelf chipsets and
4 software by Microsoft or Samsung. And they have not gone
5 beyond that, to the best of my understanding.

6 Q. Let's switch topics now.

7 MR. HOUMAND: Your Honor, we have some Respondent
8 CBI and I believe Complainant CBI on the remaining slides of
9 the presentation. So I'd ask to go on the confidential
10 record.

11 JUDGE ELLIOT: Very well.

12 (Whereupon, the hearing proceeded in confidential
13 session.)

14

15

16

17

18

19

20

21

22

23

24

25

1 O P E N S E S S I O N

2 MR. VERBONCOEUR: Good morning, Your Honor.

3 Mitch Verboncoeur for Nokia.

4 May I proceed, Your Honor?

5 JUDGE ELLIOT: Yes.

6 CROSS-EXAMINATION

7 BY MR. VERBONCOEUR:

8 Q. Good morning, Doctor.

9 A. Good morning.

10 Q. May I please have slide CDX-35C.20.

11 A person of skill in the art understands that
12 these two carets show a right shift, right?

13 A. A logical right shift, correct.

14 Q. That's your opinion. And I'm going to call this
15 a double caret. Will you understand what I mean by a double
16 caret symbol?

17 A. I do.

18 Q. During your direct testimony, you mentioned two
19 types of right shifts. We've got a logical right shift and
20 an arithmetic right shift. Do you remember that?

21 A. That's correct.

22 Q. I want to talk about testimony you gave
23 yesterday. You told us, all of us in the courtroom and the
24 judge, that that double caret symbol normally refers to a
25 logical right shift. Was that your testimony?

1 A. Not precisely. I said normally, except for in
2 the H.265 standard.

3 Q. That's right. And for H.265, you told us all
4 under oath that that was a different case; it was atypical.
5 Right?

6 A. To use double, that's correct. We saw in the RTL
7 code, normally it's three for arithmetic.

8 Q. Do you stand by that testimony today, sir?

9 A. Yeah.

10 Q. You've been an expert in cases involving the
11 H.264 standard; is that right?

12 A. Yes.

13 Q. And people of skill in the art, they know about
14 the H.264 standard?

15 A. Yes.

16 Q. H.264 standard was introduced in 2003, and it
17 quickly gained wide adoption after its introduction?

18 A. That's correct.

19 Q. Do you know the H.264 standard defines double
20 caret as an arithmetic right shift, don't you?

21 A. I do.

22 Q. And people of skill in the art, at least since
23 the H.264 standard, have been using a double caret to show
24 an arithmetic right shift for 20 years at least?

25 A. In the standards, commonly. In most books that

1 I'm familiar with, no.

2 Q. Let's have slide CDX-35C.23, please.

3 This is the H.264 standard's definition of an
4 arithmetic right shift. Do you agree?

5 A. I do.

6 Q. And you see right there, to the left, a highlight
7 on slide 23, the double caret?

8 A. I do.

9 Q. Can we please have slide 24.

10 Here's the H.265 standard's definition ten years
11 later in 2013. True or false: H.265 standard uses the
12 exact same definition of an arithmetic right shift as the
13 H.264 standard?

14 A. Absolutely. It's built on top of it.

15 Q. That's right. It's the same double caret?

16 A. Correct.

17 Q. Ten years apart, same double caret means
18 arithmetic right shift?

19 A. Yeah.

20 Q. And one of the very first things the developers
21 of the H.265 standard ever did is take that definition of
22 double caret arithmetic right shift right from the H.264
23 standard?

24 A. I assume so.

25 Q. In your direct testimony, you mentioned the

1 working drafts of the H.265 standardization process. Do you
2 recall that?

3 A. I do.

4 Q. And you said every four months or so, they put
5 out a new Working Draft that everyone was working on?

6 A. That's correct.

7 Q. And, in fact, you rely on one of those Working
8 Drafts for your invalidity theories, right?

9 A. That's right.

10 Q. Let's have slide 25, please.

11 We're looking at Working Draft 1 of
12 high-efficiency video coding. Professor, you know that
13 high-efficiently video coding refers to the H.265 standard,
14 right.

15 A. Absolutely.

16 Q. And the date here on the first Working Draft of
17 the H.265 standard is October 2010? Do you see that here on
18 slide 25?

19 A. I do.

20 Q. So in October 2010, when standardization was
21 first getting started, one of the very first things the
22 leaders of H.264 ever did was take that double caret,
23 arithmetic right shift definition, right out of the H.264
24 standard?

25 A. Was that a question?

1 Q. That's right? It was a question. One of the
2 very first things the developers of H.265 ever did was take
3 that double caret, arithmetic right shift, copy it and paste
4 it directly from the H.264 standard?

5 A. They adopted the same notation.

6 Q. I think we just agreed that the Working -- the
7 first Working Draft of H.265 is October 2010. Right?

8 A. Yes.

9 Q. Do you recall the priority date of the '267
10 patent?

11 A. I believe it was January of 2011 or -- I believe
12 January of 2011.

13 Q. January 7th, 2011 sound right to you?

14 A. Yeah.

15 Q. January 7th, 2011, the priority date of the '267
16 patent, that was just three months after the H.265
17 developers, in the very first Working Draft, had already
18 copy and pasted the double caret, arithmetic right shift,
19 exactly from the H.264 standard, right?

20 A. I don't want to attribute the copying and
21 pasting, but I agree it's consistent.

22 Q. And it's not just the ITU standards that use
23 double caret for arithmetic right shift. In fact, the AV1
24 specification uses the exact same definition, don't they?

25 A. For arithmetic right shift? I don't recall.

1 Q. Let's please have slide CDX-35C.26.

2 Professor, what I have on the top here on slide
3 26 is I've got the H.265 standard, 2013 H.265 standard, took
4 the same arithmetic right shift double caret definition from
5 H.264, and on the bottom here of slide 26, I've got the 2018
6 AV1 specification.

7 I'll direct your attention here to the top
8 definition from the AV1 specification. We've got A, double
9 caret B. Do you see that?

10 A. Yes.

11 Q. And that's the same arithmetic right shift
12 described in the H.265 standard, right?

13 A. Yeah. It doesn't call it arithmetic shift, but
14 it looks like it's an arithmetic shift.

15 Q. Same one that's described in the H.264 too, isn't
16 it?

17 A. I believe so, yes.

18 Q. Let's have slide 27, please.

19 All right. Let's recap this. Yesterday you told
20 us double caret normally refers to logical right shift.

21 A. Correct.

22 Q. But in the context of the video coding
23 standardization, we've got here on slide 27, 2003 H.264
24 standard, double caret means arithmetic right shift. Do you
25 agree with that?

1 A. For these standards, I agree.

2 Q. 2010, very first Working Draft of the H.265 copy
3 and pasted that arithmetic right shift as a double caret.
4 Right?

5 A. That's what it shows, yes.

6 Q. And the inventors of the '267 patent, that's what
7 they were working on. They were working on the H.265
8 standard, weren't they?

9 A. In part, yes.

10 Q. And then the H.265 standard kept with it and they
11 used that same double caret notation to refer to arithmetic
12 right shift?

13 A. You mean in the patent?

14 Q. I mean in the standard.

15 A. Oh, yes. I agree.

16 Q. And then in 2018, AV1 developers, consistent with
17 video coding standardization for the last 20 years, they
18 took that same arithmetic right shift definition as a double
19 caret?

20 A. It appears so.

21 Q. I want to shift gears a little bit and ask you
22 about characterization you made of the '267 patent.

23 Can I please have RDX-96C.63.

24 Doctor, you referred to the '267 patent as the
25 delaying rounding patent, right?

1 A. That's right.

2 Q. And under purported -- well, let's have slide
3 96.64, please.

4 And you described the '267 patent's purported
5 solution as "according to some embodiments of the invention,
6 prediction signals are maintained in a higher precision
7 during the prediction calculation and the precision is
8 reduced after the two or more prediction signals have been
9 combined with each other."

10 Did I read the bottom of your slide 64 correctly?

11 A. Yeah. The only thing is your question was, did I
12 describe it? You read it correctly, but it's the
13 description in the patent.

14 Q. The label here, purported solution in blue on
15 slide 64, that's yours, right?

16 A. That's right.

17 Q. Let's have slide RDX-96.71, please.

18 Professor, this is a yes-or-no question. I'm
19 looking here at your slide 71. Does rounding 4.8 to 5
20 reduce precision?

21 A. Does it reduce precision?

22 Q. Yes. Does rounding 4.8 to 5, as displayed on
23 your slide 71, reduce precision?

24 A. It cannot be answered yes or no because you have
25 to say reduced compared to what.

1 Q. You characterized the patent as the delaying
2 rounding patent. You presented to us this slide 71 and you
3 told us this characterized the patent. So it's a fair
4 question, Professor.

5 Yes or no, according to your characterization of
6 the patent, rounding 4.8 to 5 reduces precision?

7 A. It -- less than -- less than the original
8 rounding. So is 5 identical to 4.8? No. So does it reduce
9 precision? To a degree, yes, but less so.

10 Q. Right. And then so if we take round 2.4 and
11 round 2.4 and get 4, we reduce precision to a greater
12 degree?

13 A. That's right.

14 MR. VERBONCOEUR: Your Honor, at this time, we
15 need to go on the third-party confidential record.

16 JUDGE ELLIOT: Very well.

17 (Whereupon, the hearing proceeded in confidential
18 session.)

19

20

21

22

23

24

25

1 O P E N S E S S I O N

2 BY MR. VERBONCOEUR:

3 Q. During your direct testimony, Doctor, you showed
4 us these example merge lists on your slide 22. Do you
5 recall that?

6 A. I do.

7 Q. And your opinion was that, as it relates to the
8 '714 patent now, if a decoder and an encoder had these
9 matching lists, then that could satisfy this last
10 limitation, what you call 23f, of the '714 patent?

11 A. That's a requirement to satisfy this limitation.

12 Q. Right. In your opinion, these two lists, they've
13 got to be identical?

14 A. Well, they have to be the same list, yes.

15 Q. The same list, another way of saying that's
16 identical?

17 A. Well, they can be represented differently, but it
18 has to be the same list.

19 Q. Okay, the same list. And then what needs to
20 happen is that the encoder, once it has got its list, it
21 needs to include a merge_idx or some indication to the
22 decoder with the same list of which candidate to choose,
23 right?

24 A. I didn't follow your question. It's not part of
25 the element that you're asking me about, I think.

1 Q. Well, it says in 23f, shown on your slide 22,
2 "wherein the spatial motion vector prediction candidate is
3 selected from the motion vector prediction list using
4 information that was received."

5 A. Okay.

6 Q. That's received by the decoder, isn't it?

7 A. That's correct.

8 Q. And so the encoder has got to build its list,
9 then it has got to send something to the decoder with the
10 very same list telling it what candidate to choose, right?

11 A. That's correct.

12 Q. Let's have slide 96C.23, please.

13 And you told us -- and I'd rather stay on the
14 public record, if possible -- that there are certain accused
15 products out there that may use that merge_idx value that
16 you've shown here on your slide 23 to stop building their
17 list, right?

18 A. Not just "may" but "do."

19 Q. Yes. So "do." Yeah. That's right. So they use
20 the merge_idx value to stop building their list. And so in
21 your opinion, there are examples in which the merge list
22 that the encoder constructed is different from the merge
23 list the decoder constructed, right?

24 A. That's correct.

25 Q. And so in the case that we're looking at here on

1 your slide 23, we have a merge_idx value of 1. And that
2 means that the decoder only needs two candidates for its
3 lists and then it stops?

4 A. From the decoder, that's correct.

5 Q. But the encoder, the encoder built the full list.
6 And so we know the two lists are different. Don't we?

7 A. Well, we don't know what the encoder does
8 exactly, but we know that if the encoder actually followed
9 the steps that corresponds to what the decoder is instructed
10 in the standard, it would have built the whole list and it
11 would have been different.

12 Q. Is it your testimony, Professor, that you don't
13 know what list the encoder built?

14 A. Absolutely not, because the standard is only a
15 decoding standard. It does not tell us what the encoder
16 necessarily does.

17 Q. So it might be that the encoder just decided to
18 also stop at its value of merge_idx?

19 A. It's possible. Unlikely, but it is possible.
20 Nokia has to actually identify an encoder, analyze its code,
21 and show that it's the same list on both sides. And they
22 haven't done it.

23 Q. The value of merge_idx on your slide 23 could be
24 0, 1, 2, or 3, right?

25 A. That's right.

1 Q. This is a true or false question: An
2 H.265-compliant bitstream can signal a maximum number of
3 merge candidates to a decoder?

4 A. That's correct.

5 Q. Let's have slide CDX-35C.2, please.

6 What I've got here on 35C.2 is right out of the
7 H.265 standard, and what it shows is
8 five_minus_max_num_merge_cand. And that specifies the
9 maximum number of merging motion vector prediction
10 candidates supported in the slice subtracted from 5. Did I
11 read that correctly?

12 A. That's correct.

13 Q. And so if we wanted to figure out for a given
14 bitstream what the maximum number of merge candidates that
15 the encoder decided to put in that slice was, what we would
16 do is we would take 5 and then we would subtract whatever
17 value was signalled for five_minus_max_num_merge_cand,
18 right?

19 A. Yeah, but you're talking here about spatial and
20 temporal. It's not just spatial.

21 Q. Okay. And for this maximum value, if we receive
22 a 2 in the bitstream, we'll do 2 -- or, sorry, we do 5 minus
23 2, and we need to figure out, of all the candidates, three
24 is the maximum number?

25 A. Yeah. I'm not following you but 5 minus 2 is 3,

1 and I agree with that.

2 Q. So let's look at equation 7-53 of the H.265
3 standard shown here on slide 2, and let's substitute the
4 value of 2 for five_minus_max_num_merge_cand. In equation
5 7-53, we get 5 minus 2 equals 3. Do you agree with that?

6 A. I agree that 5 minus 2 is 3.

7 Q. In that scenario, max_num_merge_cand would equal
8 3?

9 A. If I understood your example correctly, then that
10 would be correct.

11 Q. And so the encoder would put in the bitstream an
12 indication saying, hey, the maximum number of candidates you
13 could possibly get in this list is 3 at this point?

14 A. It's not this list because the claimed list is
15 only spatial candidates, and the list that this is referring
16 to has nothing to do with just spatial candidates.

17 Q. Did you consider the testing evidence that
18 Dr. Moulin compiled before you formed your opinions on
19 infringement?

20 A. I looked at it, yes.

21 Q. Let's have slide 35C.4. And here we see
22 five_minus_max_num_merge_cand equals 2, right?

23 A. That's right.

24 Q. And I understand your position that a list might
25 include spatial candidates, it might include temporal

1 candidates as well, but you'll agree with me that 5 minus 2
2 means we have a maximum list size of 3?

3 A. Yeah, and it's not "might" but "has to" include
4 both spatial and temporal.

5 Q. So that's your opinion; it has got to include
6 both spatial and temporal candidates?

7 A. That's my recollection, and it also depends --
8 this list is applied to both motion vector prediction and
9 merge, and there are slightly different rules for both.

10 Q. Let's have slide CDX-35C.3, please.

11 And this is right out of Dr. Moulin's testing
12 evidence that he compiled for this case. And the first
13 thing I want to direct your attention to, Doctor, is on
14 slide 3, we've got a motion vector prediction list. We've
15 got candidate 0, spatial. Candidate 1, spatial. Candidate
16 3, spatial. Do you agree? All three of those are spatial,
17 aren't they?

18 A. In this example, yes.

19 Q. And we had a maximum list size of 3. So we had
20 an absolute maximum three candidates. Every single one of
21 those candidates, spatial. Wasn't it?

22 A. I have no idea. I just see what I see on this
23 screen.

24 Q. Do you have any reason to doubt Dr. Moulin's
25 testing evidence?

1 A. I don't recall putting the pieces together as
2 you're trying to do, and I'm not sure I am following you.

3 Q. On slide 3, CDX-35C.3, there's also a merge_idx
4 indication. It's in the upper right-hand corner of the
5 slide.

6 What's the value of merge_idx in this example?

7 A. 2.

8 Q. Okay, 2. And so which candidate on slide 3 is
9 the decoder going to choose?

10 A. So I'm not sure that I'm following you, but I
11 presume that you would argue that it points to element
12 number 2 on the list on the left, but I don't know that
13 that's a fact.

14 Q. You know there's a little asterisk next to the
15 candidate number 2, spatial B0, on slide 3 here. Do you
16 think that asterisk might mean that the decoder is choosing
17 that candidate?

18 A. That's my understanding.

19 Q. Okay. So the encoder said, hey, the maximum
20 possible list size is 3. And then even your examples of
21 decoders that only build up to merge_idx, they would also
22 include three candidates, right?

23 A. Yeah, but my recollection is that there has to be
24 a temporal candidate, but I'll take your word for it.

25 Q. So in this example on slide 3, the encoder and

1 the decoder, they built the exact same lists?

2 A. In this particular example, I don't know that for
3 a fact. It's a possibility, but it's just a happenstance.

4 Q. Yeah. And you and I disagree on whether claim
5 23f requires identical lists, but at least here we've got an
6 example where it indicates to us that encoder/decoder, same
7 list?

8 A. Yeah, but the element is still not configured to
9 do this. It may have just been by happenstance.

10 Q. Professor, you know the difference between an
11 apparatus and a method claim, don't you?

12 A. I'm not an attorney, but I have some
13 understanding.

14 Q. I want to talk to you about something you
15 mentioned a few minutes ago. And, specifically, I want to
16 ask you about the encoding claims.

17 You agree that Dr. Moulin did not rely on the
18 H.265 standard as evidence of infringement of the encoding
19 claims, right?

20 A. That's my understanding, yes.

21 Q. And you agree it would be improper to look to the
22 H.265 standard as evidence of infringement of encoding
23 claims because the H.265 standard is a decoding standard and
24 does not set forth a standard for the encoding of video?

25 A. It's partially true. It's purely a decoding

1 standard, not an encoding standard, but it does specify the
2 bitstream syntax that has to be generated, and so you can
3 look at it to some degree to determine what the output of
4 the encoder has to be to conform to the standard. But I
5 agree that mostly you have to rely on the actual
6 implementation in the source code.

7 Q. Well, let's see if we can agree on this. The
8 H.265 standard is a decoding standard and does not set forth
9 a standard for the encoding of video?

10 A. That's correct.

11 Q. Can we please have RDX-96C, slides 131, please.
12 Professor, you provided some testimony on the
13 histograms shown on your slide 131, right?

14 A. That's correct.

15 Q. And your opinion was: Well, that the patent
16 pools of Nokia, they've got similar coverage of these
17 various sections of the standard, if you break out their
18 patents as a percentage, right?

19 A. Yeah. That was the testimony I gave here, and
20 then in my report I went further and compared it to the
21 actual sections and subsections for each patent.

22 Q. Now, you don't think that every patent related to
23 a particular subsection of the standard is equally
24 important, do you?

25 A. I do not.

1 Q. Some patents can be more valuable than others?

2 A. Absolutely.

3 Q. I also want to make something else clear. You

4 didn't make these histograms?

5 A. I did not.

6 Q. Someone named Mr. Napper created these

7 histograms?

8 A. That's correct.

9 Q. Who is Mr. Napper?

10 A. He's an economics expert.

11 Q. I think you might have answered the question, but

12 he's not a video coding expert, is he?

13 A. No. He just went through and compiled data

14 that's publicly available.

15 Q. And if I heard you right, despite presenting

16 these histograms as evidence of similar coverage of the

17 scope of the standard, you didn't actually independently

18 verify that any of the data from the economist's histograms

19 was correct, did you?

20 A. I did not.

21 Q. And you didn't read any of the pool patents?

22 A. Any of the what?

23 Q. Any of the patent pool patents that you're

24 depicting on your slides 131 and 32, you didn't read any of

25 them?

1 A. I did, but not in connection with this particular
2 task.

3 Q. Okay. Thank you. So, in particular -- in
4 connection with these opinions, you didn't read any of those
5 pool patents?

6 A. That's correct.

7 Q. And you didn't check whether any of the pool
8 patent claims were actually essential to either the H.264 or
9 H.265 standard?

10 A. That's correct.

11 Q. And you didn't check whether any of the pool
12 patent claims are valid?

13 A. Are valid? No, I did not.

14 Q. Can I have slide CDX-35C.12, please.

15 I want to talk to you about binary digits. These
16 are referred to -- these are referred to as bits, right?

17 A. Binary digits are bits, yes.

18 Q. And each bit can have two possible values; it
19 could be a 0 or it could be a 1?

20 A. In binary, that's right.

21 Q. Let's have slide 35C.13, please.

22 Now, if we're not constrained to one bit, that
23 means we can express bigger numbers with more bits, right?

24 A. We can express numbers based on the number of
25 bits we have.

1 Q. Yeah. And you just told me, with one bit, we had
2 two possible values, right?

3 A. If you have a 1-bit register, then you can have
4 two possible values.

5 Q. And now if you've got 4 bits that you're using,
6 you've got 16 possible values?

7 A. If you have a 4-bit register, then you can
8 represent 16 possible values in binary.

9 Q. And one easy way of figuring out how many
10 possible values you have is you can do 2 to the nth power
11 where N is the number of slots or the number of bits that
12 you're using?

13 A. If you have complete flexibility in choosing
14 every possible combination of bits, that's correct.

15 Q. And thank you for that. That's an important
16 clarification.

17 If you don't have complete flexibility of
18 choosing every possible combination of bits, then that
19 doesn't work, does it?

20 A. That would not work, no.

21 Q. In fact, you'd have fewer than 2 to the nth
22 possible values for that binary data if you didn't have
23 complete flexibility in choosing those bits?

24 A. You would have the same precision, but different
25 number of possible values in that --

1 Q. Right.

2 A. -- in that representation.

3 Q. Go to slide 14, please.

4 Right. So I think -- I think we just agreed on
5 this. So let's go to slide 15.

6 CDX-35C.15, please.

7 Now, I think we went through it earlier, but at
8 least since H.264 through the Working Drafts of the H.265
9 standard and all the way into 81 and the present day, people
10 are using two's complement numbers in video coding, right?

11 A. Not just video coding, but whenever you have a
12 signed number, you usually use two's complement. If it's
13 unsigned, which would be the case for, let's say, luminance,
14 you very often use unsigned, which would not be two's
15 complement. So you have to look at it on a case-by-case
16 basis.

17 Q. You agree with me, in the H.264 or H.265 and AV1
18 standards, that the definition of double caret refers to a
19 two's complement number?

20 A. We just established it earlier today.

21 Q. All right. And so now what I want to do is walk
22 through how two's complement numbers work. And so what we
23 have here on slide CDX-35C.15 is a decimal math example to
24 show how you can convert from a two's complement number to
25 an actual number. And I want you to help me walk through

1 the math, Doctor.

2 So if I had a value of 0, 1, 1, 1, the way I
3 would do that is I would take 2 to the nth minus 1, I'd put
4 a negative sign on it, and then I would take, whether I have
5 a 0 or a 1 in the most significant bits place, multiply it.
6 And then I would do the same thing for the next bit and the
7 same thing for the next bit and the same thing until I got a
8 complete number. Right?

9 A. You could describe it that way. The way I
10 describe it is I just take one's complement, which is just
11 reverse all the bits, then I add one to it, and I get the
12 same -- so I get the same result you just described but in a
13 different way.

14 Q. Same result, different process?

15 A. That's right.

16 Q. Let's have slide 16, please.

17 And so like we had with the four unsigned bits,
18 for a two's complement number that's signed binary data, we
19 can take 2 to the nth, assuming that we have complete
20 flexibility in all the bits, and figure out the number of
21 possible values we can express, right?

22 A. That's right.

23 Q. And for a two's complement number, if we
24 constrain certain bits, if those bits can't change, then we
25 have fewer possible values for that binary data, don't we?

1 A. If we constrain certain -- we still have the same
2 precision, but we have fewer possible values. So I think
3 you could see the number of possible values decrease, but
4 the precision remains unchanged.

5 JUDGE ELLIOT: Mr. Verboncoeur, how much longer
6 do you have? I'd like to take our morning break sometime in
7 the next few minutes.

8 MR. VERBONCOEUR: It might be ten minutes, Your
9 Honor. So I'm happy to take a break now.

10 JUDGE ELLIOT: Okay. I have 10:29. And let's
11 come back at 10:45, 10:45.

12 And, once again, Dr. Schonfeld, during our break,
13 please don't discuss your testimony with anyone.

14 THE WITNESS: I will not.

15 (A recess was taken at 10:30 a.m., after which
16 the proceedings resumed at 10:45 a.m.)

17 JUDGE ELLIOT: Have a seat.

18 MR. VERBONCOEUR: May I proceed, Your Honor?

19 JUDGE ELLIOT: Yes.

20 BY MR. VERBONCOEUR:

21 Q. Doctor, before the break we were talking about
22 binary data, talking about right shifting. I want to get
23 your take on the term "precision" from the '267 patent.

24 In your opinion, the precision term is satisfied
25 by the number of bits needed to represent possible values?

1 A. That's correct.

2 Q. Let's have slide CDX-35C.38, please.

3 I want to move on to some larger sets of bits.

4 And then on slide 38, we have got six bits here. And, you
5 know, just like all of the video coding standards do, we
6 have got two's complement numbers.

7 I want to see if we can figure out using decimal
8 math what the value is of this two's complement number.

9 Okay?

10 A. Sure.

11 Q. So in the most significant digit place, since
12 this is a two's complement number, we need to have a
13 negative. So we have negative 2 to the 5th. Do you agree
14 with that?

15 A. You do it differently from the way I normally do
16 it, but I follow what you're saying.

17 Q. Okay. And maybe we can short-circuit this. On
18 slide 38 here we have 101100. And the way you can express
19 that is negative 32, plus 8, plus 4, gives you a value of
20 negative 20 for two's complement?

21 A. Yeah, that's correct. The only thing is I would
22 say the way I teach it is you take two's complement of it,
23 it gives you the absolute value and then you look at the
24 most significant bit. It tells you it's a 1. Therefore,
25 you know it's negative. It comes out to be the same.

1 Q. Okay. So it's the same math, just in the way you
2 do it, you're going to get the same absolute value, but if
3 you got a 1 in the most significant digits place, you have
4 got a negative, and if you have a zero, you have a positive?

5 A. That's right. And the reason I teach it that
6 way, that's how the computers usually operate.

7 Q. But we can agree on slide 38 the set of bit
8 values that are displayed equates to negative 20 using
9 decimal math?

10 A. I didn't check you, but I trust your -- the value
11 there is correct.

12 Q. Let's just make extra sure just so that we're
13 clear on the record here. We have a 1 in the most
14 significant digits place --

15 A. Yes.

16 Q. -- and we have a 01100. You agree that works out
17 to negative 20?

18 A. That looks right.

19 Q. Let's have slide 39, please. Now we have got a
20 very similar example except now we added a bit. Now we have
21 on slide 39, 1011001. I want you to check my math again to
22 make sure it is right.

23 Can you do that for me, please?

24 A. Yeah, that's correct.

25 Q. Thank you.

1 Let's go to slide 40, please.

2 So on slide CDX-35C.40, we have added another
3 bit. We're still using two's complement numbers. I would
4 like you to again, and I thank you for indulging me, check
5 my math.

6 A. Okay.

7 I didn't check every digit, but it looks correct.

8 Q. Thank you. Now let's have slide 35C.31, please.

9 Now what this is is we have a series of three
10 two's complement numbers, and we have right-shifted them.
11 We have done an arithmetic right shift, like the way the
12 H.264 standard, the H.265 standard, the AV1 specification
13 all tell us.

14 And so the way that an arithmetic right shift
15 works is we have a 1 in the most significant bits place. We
16 want to preserve that. So we keep it. But we're
17 right-shifting so we move that 1 one place over. Right?

18 A. Correct.

19 Q. Okay. Now what I would like you to do is check
20 my math. For the first one, the very top of the slide, 31,
21 we get a value of negative 77.

22 A. I didn't check everything but it looks about
23 right.

24 Q. That's -- in fact, actually that's the same
25 number we had just looked at before?

1 A. Okay.

2 Q. And now let's look at the middle example here in
3 slide 31, we have got 11011001. And we get a value of
4 negative 39? Do you want to check that for me, please,
5 Professor?

6 A. Is that the one we already did earlier? I will
7 take your word for it.

8 Q. Okay. Now let's have slide CDX-35C.42, please.

9 What I have done, Professor, with the examples we
10 have walked through, I took your slide, RDX-96C.80, and you
11 were explaining to us that a logical right shift versus an
12 arithmetic right shift is somehow different and that it
13 causes, you know, a different result that's material somehow
14 to the '267 patent.

15 And we just agreed with the math for all of the
16 strings of bits on the left-hand side of your slide 80 and
17 then again for all of the strings of bits on the right-hand
18 side of your slide 80, and in each case, we have got the
19 same numerical values.

20 A. Is that a question?

21 Q. Yeah. And that's a true-or-false question. In
22 each case, we get the same numerical values.

23 A. That's correct. And I think it illustrates my
24 point even more strongly than I did initially to be honest
25 because it shows that the precision remains the same on the

1 right side, because you need the most significant bits.
2 Therefore, the precision remains the same, the values
3 decrease.

4 Q. And I understand that's your argument. And I
5 also want to point something else out. If you take the top
6 number in both examples, negative 77, what happens when we
7 divide that by 2? Do you agree with me that we get negative
8 38.5?

9 A. Yeah, but by the way, just one comment. I didn't
10 realize that you were interpreting the number on the left as
11 being a signed 2th complement number which is not exactly
12 the right thing to do but I understand the exercise you did.

13 Q. I told you at the time that those were two's
14 complement numbers.

15 A. Yeah. I just didn't pay attention to this
16 because that would be a mistake to do logical shift on two's
17 complement.

18 Q. Right. Since H.264, people have been using two's
19 complement numbers?

20 A. Not with logical shift.

21 Q. Are they using logical shift in the H.264
22 standard? We just looked at the definition of a right shift
23 in the H.264 standard.

24 A. I am not sure if there is a separate logical
25 shift for unsigned numbers or not. There might be. I don't

1 know.

2 Q. Let's check. Let's have slide CDX-35C.23.

3 And then let's have JX-23, pages 29 and 30 right
4 across the break in the page, please.

5 Mr. Moreno, what I want you to do is take JX-23.
6 I want you to put the bottom of page 29 and then the top of
7 page 30. Thank you.

8 Actually, it would be 30 and 31. I apologize.

9 All right.

10 We're looking here at the H.264 standard. We're
11 seeing the section bit-wise operators. And it continues.
12 You tell me, Professor, do we see a logical right shift
13 definition?

14 A. Not in this section, no.

15 Q. In the H.265 standard, they copy those exact same
16 definitions, didn't they?

17 A. That's correct. My point is that no logical
18 shift is applied to two's complements in -- but you did it
19 in your example.

20 Q. I apologize, Professor. A person of skill in the
21 art, they would not think to use a logical right shift on a
22 two's complement number, right?

23 A. That's correct.

24 Q. And when they are working with negative values
25 sometimes, they would know you have got to use two's

1 complement to represent them?

2 A. You have got to use two's complement to represent
3 negative numbers.

4 MR. VERBONCOEUR: No further questions, Your
5 Honor. Pass the witness.

6 MR. BUI: No questions for the witness, Your
7 Honor. Thank you.

8 JUDGE ELLIOT: Very well.

9 MR. HOUMAND: Just a few brief questions from
10 Respondents.

11 REDIRECT EXAMINATION

12 BY MR. HOUMAND:

13 Q. Dr. Schonfeld, do you recall having a fairly
14 extended discussion with Nokia's counsel regarding whether
15 the 2 caret symbol is an arithmetic shift in H.264, H.265,
16 and AV1?

17 A. That's correct.

18 Q. And you agreed with Nokia's counsel that that
19 double caret symbol is an arithmetic right shift; is that
20 correct?

21 A. In the standards, in those standards, yes.

22 Q. And is that consistent with the non-infringement
23 testimony that you presented today?

24 A. That's the basis of my non-infringement
25 testimony.

1 Q. And can you explain?

2 A. Yeah. In order to reduce precision by shifting,
3 it has to be a logical shift. H.265 has an arithmetic
4 shift, which cannot be used to change precision, as I showed
5 in the code itself, in the implementation. And then in
6 addition, in AV1, there is no shift, there is a round2
7 operation. And, therefore, there is no shifting at all.

8 And even in the implementation that I showed in
9 one of the slides, there is a shift that occurs later but
10 not on the combined prediction, but as counsel for Nokia
11 just showed, even that shift is not a shift that can change
12 precision because it would still be an arithmetic shift.

13 MR. HOUMAND: Nothing further, Your Honor.

14 JUDGE ELLIOT: Very well. Dr. Schonfeld, thank
15 you very much.

16 THE WITNESS: Thank you, Your Honor.

17 (The witness stood down.)

18 MR. JOHNSTON: Good morning, Your Honor. Karl
19 Johnston on behalf of Amazon. Respondents next witness is
20 Dr. Nisha Mody.

21 Whereupon--

22 NISHA MODY,

23 having been first duly sworn/affirmed, was examined and
24 testified as follows:

25

1 THE WITNESS: I do.

2 DIRECT EXAMINATION

3 BY MR. JOHNSTON:

4 Q. Good morning, Dr. Mody.

5 A. Good morning.

6 Q. Can you please introduce yourself to the ALJ.

7 A. My name is Nisha Marie Mody. I'm a managing
8 director at a company called Secretariat.

9 Q. What do you do as a managing director at
10 Secretariat?

11 A. I focus on financial and economic analysis. I
12 have had opportunities to testify in district courts across
13 the country on damages issues, specifically for patent
14 infringement cases and other intellectual property cases.
15 And I have also had opportunities to testify at the ITC on
16 issues of economic domestic industry, remedy, bond, and
17 public interest.

18 Q. And did you prepare demonstratives to assist your
19 testimony today.

20 A. I have.

21 Q. And is that what we have on the screen here,
22 RDX-99?

23 A. That's right.

24 Q. All right. I am going to turn to slide Number 2.
25 Dr. Mody, could you just please provide us a quick overview

1 of your background and education?

2 A. A quick overview is that I have a Ph.D. in
3 political economy and public policy from the University of
4 Southern California. I have a Bachelor of Arts degree from
5 Pomona College. And I have -- I was calculating this last
6 night -- 25 years of experience doing economic analysis and
7 financial analysis.

8 MR. JOHNSTON: And at this point, Your Honor, we
9 offer Dr. Mody as an expert in economic domestic industry,
10 remedy, and bond and the public interest.

11 JUDGE ELLIOT: Very well.

12 BY MR. JOHNSTON:

13 Q. All right. Turning to slide Number 3, Dr. Mody,
14 could you please just summarize your opinions that you have
15 reached in this case?

16 A. At a high level overview is that I have reviewed
17 Mr. Herrington's opinions and analysis. And I have found
18 that he has not provided proper support for an economic
19 domestic industry.

20 One of the major issues with his analysis is that
21 he hasn't properly identified the patent-practicing article.
22 That patent-practicing article is the chipset. He counts
23 entire investments in the downstream products. He includes
24 non-cognizable investments. And his opinions are --
25 regarding domestic industry are conclusory, especially with

1 regard to his significance opinions.

2 I have also considered that the proposed remedies
3 that Nokia is requesting would harm the public interest.

4 Q. Did you testify in the 1379 investigation?

5 A. I have.

6 Q. And are your opinions here substantively the same
7 as those that you gave in the 1379 investigation?

8 A. They are substantively the same, largely because
9 Mr. Herrington's analysis has not changed in terms of his
10 domestic industry analysis between that case and this case,
11 and so my opinions regarding his analysis has not changed.

12 But the subset of products that are at issue in
13 this case are a little bit different. And then also the
14 technology in this case is different in terms of patents.

15 Q. Did you observe testimony at the hearing this
16 week?

17 A. I have been here for most of the hearing, not
18 yesterday.

19 Q. And did any of the testimony that you heard
20 change any of your opinions?

21 A. It did not.

22 Q. All right. Turning to slide number 4.
23 Mr. Sayres, if you could do RDX-99C.4.

24 All right. What products do Nokia and
25 Mr. Herrington identify as the domestic industry products in

1 this investigation?

2 A. Nokia and Mr. Herrington identified the
3 downstream products, Xbox Series X and S, the Surface
4 laptops and the Surface Pro. Those are the Microsoft
5 products and then the Samsung product is the Galaxy phones.

6 Q. Are these the same domestic industry products
7 that Nokia identified in the 1379 investigation?

8 A. Yes. They are the same products.

9 Q. So is it your understanding that these are the
10 patent-practicing articles for the purposes of domestic
11 industry?

12 A. No.

13 Q. So what is your understanding of the
14 patent-practicing article?

15 A. My understanding of the patent-practicing article
16 is that the patent-practicing articles are the chipsets, the
17 GPUs, the CPUs, and the Android OS.

18 Q. And what's the basis of that understanding?

19 A. It is really the six technical experts, all six
20 of them. I had an opportunity to speak with Dr. Saber,
21 Dr. Storer, and Dr. Schonfeld. And I have listened to the
22 testimony and I have also read the testimony of Dr. Kia, Dr.
23 Moulin, and Dr. Orchard.

24 Q. All right. Turning to slide 5, are there
25 circumstances where domestic industry investments can be

1 extended beyond the patent-practicing article?

2 A. There are. It's really an analysis that's done
3 on a case-by-case basis. One has to assess the realities of
4 the marketplace in order to understand whether that is
5 appropriate, that expansion of the domestic industry.

6 Q. And what are the factors you consider when
7 analyzing the realities of the marketplace?

8 A. The three factors are on this slide. I will read
9 them: Whether the patented technology is sold as a separate
10 entity or article of commerce, whether it is essential -- it
11 is an essential component of the downstream product, and
12 whether the domestic industry activities have a direct
13 relationship to the exploitation of the patented technology.

14 Q. So in your opinion, do the realities of the
15 marketplace support counting investments by Microsoft and
16 Samsung in the user products that Mr. Herrington has
17 considered?

18 A. I missed your question. I'm sorry.

19 Q. I'm sorry. In your opinion, do the realities of
20 the marketplace in this investigation support the downstream
21 investments for Microsoft and Samsung that Mr. Herrington
22 looked at?

23 A. No, they do not.

24 Q. Turning to slide Number 6 here, can you briefly
25 explain why not?

1 A. There is a lot on this slide. The far left-hand
2 side of the slide has the separate articles of commerce and
3 the considerations under that -- that factor. And we can
4 see that the chipsets are actually supplied. They are
5 supplied to the public. The chipsets are developed,
6 manufactured, and sold or offered to sale by AMD, NVIDIA,
7 Intel, and Qualcomm.

8 We also see that the Android OS is software
9 provided by Google for free. Dr. Kia testified that he
10 actually downloaded the software from, I think it was like
11 Samsung.Android.com. So he was able to get that information
12 for free or that software for free.

13 Q. And is there an exclusive operational
14 relationship between the chipsets and the downstream
15 products?

16 A. No. I think it's important to understand that
17 with respect to the Xbox, the Surface products, and the
18 Galaxy products, there is -- that there is no direct
19 exclusive operational relationship between those and the
20 AMD, Intel, and NVIDIA chips. You can see from the slide
21 that those chipsets are purchased by Lenovo, HP, Acer, Dell,
22 as well as ASUS and other companies, third parties.

23 Q. Are the investments that Mr. Herrington
24 considered, do they directly relate to exploitation of the
25 patented technology?

1 A. No. In fact, we have no demonstration that any
2 of the expenditures that Mr. Herrington has reviewed have
3 any direct relationship to the patented technology. And, in
4 fact, we can see from his analysis that his analysis hasn't
5 changed between this case and the previous case, the 1379
6 case.

7 So we know that his analysis, because there is
8 two sets of patents for the two different cases, and he
9 hasn't changed his opinion, we know that it is not related
10 to the patented technology specifically.

11 Q. So we have heard some testimony this week about
12 customized chipsets. What is your understanding about
13 whether any of the chipsets in the domestic industry
14 products are customized?

15 A. I have heard that there's AMD chipset that is
16 customized for Xbox.

17 Q. So assuming that the chipset is customized in
18 some way, does that change your opinion that the AMD chipset
19 in the Xbox product is a separate article of commerce?

20 A. It does not. The AMD chipset is still designed,
21 developed, manufactured by AMD.

22 Q. And would any customization change your opinion
23 about whether there is an exclusive operational relationship
24 between the patented technology and the end user products?

25 A. No. The Xbox is not necessary to bring the

1 patented technology to the consumer market. That's the case
2 for all of the products. But the Xbox is not necessary for
3 that. We see that it is -- yeah, it is not necessary for
4 that.

5 Q. Have you seen evidence that the Microsoft --
6 excuse me -- the AMD chipset is sold exclusively to
7 Microsoft?

8 A. We have seen no evidence that it is sold
9 exclusively to Microsoft. We have seen no evidence that
10 this customized chip is -- can only be used with Microsoft,
11 the Xbox product.

12 Q. And does Samsung's work to ensure that the Galaxy
13 phones work with U.S. cellular carriers have anything to do
14 with the patented technology or domestic industry?

15 A. It doesn't. It doesn't have anything to do with
16 the Android OS. I have not seen any evidence that any of
17 that carrier -- those carrier expenditures have anything to
18 do with that patented technology or the OS.

19 Q. All right, Dr. Mody. Let's move on to public
20 interest.

21 Can you briefly summarize your opinions related
22 to the public interest factors?

23 A. Really just a summary is that the Nokia's
24 requested remedy will have a negative effect on the public
25 interest factors.

1 Q. And did you have the same opinion in the 1379
2 investigation?

3 A. I did.

4 Q. All right, Dr. Mody. I want to start by asking
5 about one of those public interest factors.

6 Mr. Sayres, if you could advance the slide,
7 please.

8 This is slide Number 7. Do any of the accused
9 products have health or welfare applications?

10 A. They do. We know that Amazon and HP sell their
11 products to hospitals, Sloan Kettering, Boston Children's
12 Hospital, for example. Amazon offers Amazon Pharmacy. They
13 partnership with One Medical, Teladoc, and Omnicell.

14 HP actually has a specific healthcare line of
15 products that are designed to be able to be used in
16 operating rooms as clean and desanitized products.

17 We also know that with respect to the Amazon
18 Show, for example, that specifically supports seniors and
19 caregivers, including urgent response and fall detection.

20 Q. And do the accused products have any relevant
21 accessibility features?

22 A. They do. Amazon is very focused on
23 accessibility, accessibility features and having their
24 products provide that accessibility. There is specific
25 Alexa Show and Tell and Be My Eye skills for the visually

1 impaired. And Alexa has approximately 100,000 skill sets,
2 many of which are relevant for accessibility. Amazon is
3 also partnered with a company called Arc, which is the
4 largest disability advocacy organization.

5 Q. Finally, do the accused products have any
6 relevant educational features?

7 A. Amazon or HP -- HP's educational edition PC is
8 much like the healthcare edition PC, but instead it is
9 designed specifically for educational purposes. Amazon also
10 has its Fire Tablet that has WorldGuard unique parental
11 controls. Both Amazon and HP have tech solutions. They
12 partner with schools and their products are used in schools.

13 Q. Have Nokia or its experts pointed to devices that
14 can replace the full suite of products and features that you
15 just described?

16 A. Not the full suite of products. There are
17 features -- there are products that I can understand that
18 might provide one or two of these features but not all of
19 these features. Certainly not the suite of accessibility
20 features or the breadth and depth of the features that are
21 offered by the products with -- that Amazon and HP offer.

22 Q. All right, Mr. Sayres, if we could advance to
23 slide 8, please.

24 Did you form any other opinions on public health
25 and welfare as it relates to Amazon?

1 A. I have. Amazon employs more than 1.1 million
2 people in the United States currently. They are the second
3 largest non-governmental employer in the United States.
4 They are an innovator. They have over 25,000 patents.

5 They invested more than \$1 trillion in the U.S.
6 economy since 2010. They have contributed \$880 billion to
7 the U.S. GDP. And they are very much in the community and
8 support non-profits, as well as partner with small
9 businesses.

10 Q. And turning to slide Number 9, do you have any
11 other opinions as it relates to HP on the public health and
12 welfare?

13 A. With regard to HP, HP is a government supplier.
14 They have over 20,000 patents. And, importantly, they have
15 nearly 20,000 U.S. employees and -- in the United States,
16 and more than 2,000 of those employees in the United States
17 work directly on the accused products.

18 Q. All right. If we could turn to slide Number 10.

19 Have you formed any opinions regarding the
20 competitive conditions in the U.S. economy as it relates to
21 the accused products?

22 A. I have. These are the -- these are -- the
23 accused products are the preferred products for customers.
24 They are the products that the customers want to purchase in
25 terms of value price tablets, tablets priced for those

1 customers that are considering pricing when they are
2 purchasing a tablet. Amazon supports roughly 48 percent of
3 that group in the United States.

4 In terms of Smart Home displays with respect to
5 the Echo Shows, Amazon provides roughly 65 percent of that
6 preferred audience. With respect to streaming media
7 players, the Amazon Fire Sticks represent roughly 45 percent
8 of that marketplace as well. And then with respect to HP,
9 HP is the most preferred PC on the market in the United
10 States, roughly, I think it is -- 27 percent of the
11 marketplace is dedicated to HP's offerings in the United
12 States.

13 Q. Have you seen evidence of reasonable substitutes
14 if there was an exclusion order entered on these products?

15 A. I haven't. And I think what is important to
16 consider is that we can think about maybe an iPad being a
17 substitute for an Amazon Fire Tablet, an accused Fire
18 Tablet.

19 But what is really important in terms of that
20 consideration -- and I spoke about this a lot in the 1379
21 case, and I am not going to reiterate that here -- that iPad
22 is so much more expensive than Amazon's offerings in terms
23 of its Fire product.

24 And so with consumers, you know, these are normal
25 goods and consumers are going to be concerned about the

1 prices. And a consumer that is willing to spend \$100 on
2 something is not going to necessarily be willing to spend
3 \$1,000 on something.

4 Q. And have you seen any evidence that other
5 manufacturers and suppliers could fill the void left by a
6 potential exclusion order?

7 A. I have not seen that. And I would say that this
8 is really across all of the products that are accused in
9 this case. They are value-priced products and they are
10 considered value-priced products.

11 Q. And how would the scope of an exclusion order
12 compare to the accused functionality at issue?

13 A. My understanding is that the accused
14 functionality is a minor component of the Codec, which is a
15 minor component of the chipset, which is one component of a
16 downstream product that has thousands of features on it.

17 And so the whole idea that Nokia is coming in
18 requesting that all of these products be taken off the
19 market seems to be out of balance with the contribution of
20 these products to this market.

21 Q. And did you assess the effect that an exclusion
22 order would have on U.S. consumers?

23 A. I have. I spoke again about this in the 1379
24 case, but briefly, when you're reducing the number of
25 offerings in the marketplace, you're going to see an

1 increase in pricing. You're going to see at least
2 short-term and potentially long-term issues regarding
3 shortages.

4 And you're going to see -- I mean, those are the
5 primary problems.

6 Q. All right. Finally, Dr. Mody, you provided an
7 opinion on remedy. Mr. Sayres, if we could turn to slide
8 Number 11.

9 Before I ask you, were you in the courtroom when
10 Mr. Herrington explained his inventory analysis?

11 A. I was. And he -- yes.

12 Q. And what was your reaction to that testimony?

13 A. He actually -- he really mischaracterized, I
14 think, Amazon's position on this issue. I think -- I think
15 what he said was not what Amazon's position is and it was
16 certainly nothing that I offered a position on, the way he
17 stated that I did.

18 Q. Has Amazon ever taken the position that it
19 doesn't have significant domestic operations?

20 A. Not to my knowledge. I just showed you a slide
21 that demonstrates that Amazon is the second largest
22 non-governmental provider of jobs in the United States. It
23 has significant operations in the United States.

24 Q. So what then are your criticisms of
25 Mr. Herrington's inventory analysis you have on this slide

1 here?

2 A. In terms of Mr. Herrington's inventory analysis,
3 it is just -- it was just a misrepresentation.
4 Mr. Herrington provided a broad overview of a lot of
5 different categories, I think five different categories of
6 products, but he actually did not provide the inventory
7 analysis on any product-specific basis.

8 And so he, for example, the Amazon Echo Show kids
9 edition doesn't have inventory available. So he just
10 glossed over that. And he also added discontinued products,
11 17,000 days of inventory for discontinued product is added
12 to his inventory, and included in his per day analysis. And
13 then, finally, he doesn't prorate for midyear releases of
14 products. And he assumes that the demand for a midyear
15 released product is equal to the demand for the entire year.

16 And for specific products, this results in an
17 over 400 percent increase in the -- what he is saying in
18 terms of the inventory available.

19 Q. So there was some suggestion Mr. Herrington
20 corrected his calculations between the 1379 and 1380
21 investigation. Dr. Mody, did Mr. Herrington fix the issues
22 that you're showing on this slide between the two
23 investigations?

24 A. Not the issues I am showing on this slide. He
25 fixed something regarding refurbished units, but not the

1 issues that I am showing on this slide.

2 Q. Thank you, Dr. Mody.

3 MR. JOHNSTON: We pass the witness.

4 CROSS-EXAMINATION

5 BY MR. SWAIN:

6 Q. Good morning, Dr. Mody. How are you?

7 A. Hi.

8 Q. It's good to see you again.

9 I brought with me today a stopwatch. And the
10 reason we have a stopwatch in the courtroom is to make sure
11 the attorneys stay on time but I used it this morning to
12 time how much -- how long you spent on each topic.

13 Now, we just heard 7 and a half minutes, Dr.
14 Mody, of you talking about how important Amazon's accused
15 products are to the competitive conditions of public health
16 and welfare of the United States. Fair?

17 A. You have got the stopwatch.

18 Q. Okay. Trust me, it says 7 and a half.

19 And you understand at the same time Amazon is
20 arguing that despite how important these products are and
21 how many people they have in the United States and how many
22 people have their products, they still argue that Nokia has
23 no proof that Amazon's inventory is sufficient to warrant a
24 cease and desist order. Correct?

25 A. I'm not sure if that's what Amazon is arguing. I

1 have demonstrated that there are some products that do not
2 show inventory on hand.

3 Q. Yeah. You just spent, actually, three minutes
4 talking about inventory of Amazon. But I want to be crystal
5 clear, you're not arguing that Amazon does not have a
6 substantial domestic inventory of accused products in the
7 United States, correct?

8 A. I haven't made that argument. What I have said
9 is that Mr. Herrington has not provided an analysis that
10 allows one to assess inventory on a product-specific basis.

11 Q. I am going to ask you the same way Judge Johnson
12 Hines asked you, Dr. Mody. Are you ready?

13 A. Sure.

14 Q. Are you, Dr. Mody, presenting an opinion that
15 Amazon does not have a substantial domestic inventory? Yes
16 or no?

17 A. No, I am not.

18 Q. Thank you.

19 A. It is the same answer that I just provided.

20 Q. I'd like to talk about your articles in commerce
21 -- oh, I apologize.

22 JUDGE ELLIOT: Okay, hold on. Hold on. Let me
23 just say again, we have to have one person talking at a
24 time. So --

25 THE WITNESS: Apologies.

1 JUDGE ELLIOT: Please don't talk over each other.

2 MR. SWAIN: Understood, Your Honor. Thank you
3 for the reminder.

4 BY MR. SWAIN:

5 Q. Dr. Mody, so that it is clear in the record, yes
6 or no, and I need a yes-or-no answer to this question, are
7 you presenting an opinion that Amazon does not have a
8 substantial domestic inventory of accused products?

9 A. No, I am not. It is the same answer that I just
10 gave.

11 Q. Thank you, Dr. Mody. I would like to talk now
12 about articles in commerce. First, about the Samsung Galaxy
13 phone. That's one of the DI products that are relied upon
14 by Mr. Herrington, correct?

15 A. Yes.

16 Q. And Samsung Galaxy phone, it uses Android OS to
17 operate, correct?

18 A. That's my understanding.

19 Q. Okay. And that's the article in commerce that
20 you're pointing to as the patent-practicing article and
21 that's what's being sold in commerce, right?

22 A. It's being offered by Google as open source for
23 free.

24 Q. Okay. Now, you agree with me that the Samsung
25 Android OS on the Samsung Galaxy phone itself, that is

1 customized by Samsung, right?

2 A. The Galaxy is being customized by -- I'm sorry.

3 Q. No, no.

4 A. I'm sorry.

5 Q. Let me rephrase. The Android OS code that is
6 installed on the Galaxy phone and then given to consumers,
7 that Android code is customized by Samsung, correct?

8 A. I am not certain.

9 Q. Okay. Let's see what Amazon and Respondents have
10 to say about that. Could I have CDX-36.7, please.

11 Even Respondents admit that public documentation
12 shows that it is known that Samsung modifies the Android OS
13 for its Galaxy products. Do you see that, Dr. Mody?

14 A. I see what you're reading, yes.

15 Q. Do you have any reason to disagree with your
16 attorney's arguments?

17 A. I haven't looked at the documentation. I'm happy
18 to look at the documentation but I can't -- I can't really
19 comment on this as I sit here.

20 Q. Okay. And we know, Dr. Mody -- we can take that
21 down. We know, Dr. Mody, that we can't use a Samsung Galaxy
22 phone without the Android operating system, right?

23 A. There -- I think it needs an operating system. A
24 product needs an operating system. It doesn't need the
25 patents but it needs the operating system.

1 Q. Virtually everything one does with a Samsung
2 Galaxy phone involves the Android operating system, right?

3 A. I will take your word for it.

4 Q. Do you have any reason to disagree with that?

5 A. I don't.

6 Q. Okay. Are you aware of any Galaxy DI phone in
7 this investigation that is sold without the Android
8 operating system installed?

9 A. I don't -- I don't think so. I don't have
10 information either way.

11 Q. Are you aware of the version of Android, the
12 customized version for Galaxy of Android operating system,
13 are you aware of that being installed on any other phone,
14 other than the Samsung Galaxy phones?

15 A. No. We don't have evidence either way. We don't
16 have evidence either way about that.

17 Q. Thank you, Dr. Mody.

18 I want to talk about the Xbox now. Do you play
19 video games, Dr. Mody?

20 A. I don't.

21 Q. You don't have time for that?

22 A. I do have time. It's just not a priority.

23 Q. I hope there is no gamers in the room.

24 But I want to talk about the Xbox. And
25 specifically the Xbox Series X and S. I want to be clear,

1 because I heard some interesting things on your direct now.

2 There is no dispute that the Xbox Series X and
3 the Xbox Series S, the two DI products for Xbox, they do
4 have a customized GPU, CPU from AMD, correct?

5 A. That's what I have heard.

6 Q. Okay. Again, could I have CDX-36.7 on the board,
7 please.

8 Again, public documentation confirms this,
9 Dr. Mody, that the Xbox domestic industry products use a
10 customized chipset. Do you see that?

11 A. I see that.

12 Q. This is Respondents' Motion for Summary
13 Determination.

14 A. I believe you.

15 Q. And they would tell the truth to the ALJ,
16 correct?

17 A. I believe that would be the case too.

18 Q. And I heard you say, though, that there's no
19 exclusive operational relationship between the custom AMD
20 GPU and CPU for the Xbox Series X and the Xbox Series X
21 itself? Is that true?

22 A. We have no idea who does the customization,
23 whether that customization has anything to do with the
24 patented technology.

25 Q. Okay. Could I have CDX-36.2 on the board,

1 please.

2 These are the two Xbox domestic industry
3 products, Dr. Mody, the Series S and Series X, correct?

4 A. I see those.

5 Q. Okay. These are the data sheets that the
6 technical experts and yourself have pointed to, right, to
7 show evidence of what these products offer. They are public
8 documentation, right?

9 A. I am definitely not pointing to anything on the
10 right-hand side of that slide for my testimony.

11 Q. Okay. I think that's pretty obvious. But if you
12 look here, you agree with me the CPU and the GPU here are
13 both custom products, correct?

14 A. I can -- I mean, I see the word custom on this --
15 on this document.

16 Q. Have you seen any evidence in the record,
17 Dr. Mody, from yourself or anyone else that these custom
18 GPUs and CPUs are sold to anyone else other than Microsoft?

19 A. We've seen no evidence either way. We've seen no
20 evidence that they are sold only to Microsoft, and we have
21 seen no evidence that they are not sold only to Microsoft.
22 We -- we have just not seen evidence either way.

23 Q. Yes or no, Dr. Mody, you have seen no evidence
24 that these custom GPUs and CPUs are sold to anyone else,
25 other than Microsoft?

1 A. Right. We have seen no -- we have seen no
2 evidence either way. There's no -- there's no evidence that
3 they are not sold exclusively to --

4 Q. There's a word on here, Dr. Mody. It says SOC
5 die size. Do you see that?

6 A. I see it.

7 Q. Are you familiar with what SOC means,
8 system-on-chip?

9 A. I think I know that.

10 Q. You know what a system-on-a-chip, is right? It's
11 the CPU and the GPU and everything else and they integrate
12 it into one packaged circuit, right?

13 A. I think you're going beyond the scope of my
14 technical knowledge. But if you want to say that, you can
15 say that.

16 Q. Well, this is what you're pointing to, Dr. Mody,
17 is the article in commerce that is sold to other people. I
18 really want to know what your knowledge is as to what is
19 being sold to other people.

20 So do you know if it's an SOC and what that SOC
21 is?

22 A. Mr. Swain, I think I was clear in the beginning,
23 I'm relying on the testimony of the technical experts, there
24 are six technical experts. They all agree that the CPU and
25 the GPU and the Android OS are the patent-practicing

1 articles.

2 And so I'm not relying on this RX-3290 and
3 RX-3291.

4 Q. That wasn't my question, Dr. Mody. I am not
5 asking you to take a technical opinion. I am asking you if
6 you know if this -- these custom SOCs with the GPU and the
7 CPU are sold to anyone else, other than Microsoft? Because
8 you're the economist here who is talking about articles of
9 commerce.

10 A. We do not know whether they are sold only to
11 Microsoft or whether they are sold to a lot of other
12 customers. We just don't know that. There is no evidence
13 either way.

14 Q. Okay. Isn't it true, though, that those two
15 products that were developed with AMD, these two CPUs and
16 GPUs, Microsoft worked with AMD to develop these products?

17 A. I am not certain, but okay.

18 Q. Okay. Can I have CX-988.5. Despite its look,
19 this is a public document. CX-988.5, please.

20 This is a public document from Microsoft, Xbox
21 Series X. That's a domestic industry product, correct?

22 A. It is.

23 Q. Okay. And I believe on page 3, I misspoke, do
24 you see that? That's the article in commerce you're
25 pointing to, Dr. Mody, as being sold to other people? Do

1 you see that?

2 A. The GPU.

3 Q. The GPU, nothing beyond that?

4 A. It's -- well, it's the chipset. It's the GPU.

5 Q. The chipset doesn't include the CPU?

6 A. Well, it's the CPU or the GPU. It's the chipset.

7 Q. Do you see here, the last bullet point from
8 Microsoft putting out to the world that they developed this
9 chip with AMD, correct?

10 A. I see what's written on this slide.

11 Q. Thank you. In fact, this custom co-designed GPU
12 from AMD for the Microsoft Xbox Series X according to record
13 evidence is the biggest generational leap that AMD has ever
14 done with Microsoft. Did you see that?

15 A. I have not seen that.

16 Q. Can we have CX-1597 at 5, please. It says here,
17 Dr. Mody, in a news article --

18 A. Just a minute. Give me one second.

19 Q. Highlight the last paragraph there, starting with
20 Xbox Series X. Down.

21 A. May I just ask you a quick question? Is this the
22 article that was relied on by Mr. Herrington? I just don't
23 see it.

24 Q. It was relied upon by several people. This came
25 in through the technical experts that you were here for, Dr.

1 Mody.

2 A. Okay.

3 Q. There we go. "It starts with Xbox Series X is
4 the biggest generational leap of SOC, system-on-a-chip, in
5 API design that we have, AMD, have done with Microsoft. And
6 it's really an honor for AMD to be a trusted Microsoft
7 partner for this endeavor."

8 Do you see that, Dr. Mody.

9 A. I see what you're reading.

10 Q. Okay. Is it still your opinion that this GPU/CPU
11 system-on-a-chip is sold to other people?

12 A. I -- I think I should be clear that we have no
13 evidence whether this is sold only to -- for the Xbox or
14 whether it's sold to others. We -- we just don't know. We
15 haven't seen that evidence. So I think you're
16 mischaracterizing my testimony a little bit. I'm sure you
17 don't mean to.

18 Q. You did produce some, in your slide -- actually
19 can I have up -- let me see what you did point up to. Can I
20 have RDX-99.C, please. Or 99.6, please.

21 On the left here you're telling this Commission,
22 the ALJ, that these are separate articles of commerce and
23 you cite to your documentation here, the research you did,
24 right?

25 A. That's right.

1 Q. Okay. Now, these are all public websites,
2 BestBuy, Nuway, I think Alibaba, maybe NVIDIA. You went on
3 and you printed out some inventories that they might have of
4 CPUs and GPUs, right?

5 A. I did.

6 Q. Okay. Now, you're not going to find anywhere
7 these AMD custom SOCs for sale by these websites, correct?

8 A. I'm not sure.

9 Q. You're not sure? You're putting them forward to
10 the Commission, Dr. Mody, and you're telling the Commission
11 that you don't know if they are sold in articles in commerce
12 or not, but can you tell me if they're on the evidence that
13 you reviewed?

14 A. I -- I don't believe -- well, so you're asking me
15 one question and then you're making a statement that I'm
16 saying something else. I -- the documentation that's on
17 this slide provides information about what I was able to
18 find from the websites.

19 I don't know that I can find the AMD product on a
20 website. I just -- I just don't know that. We don't know
21 that either way.

22 Q. Now, under oath, do you know, the evidence that
23 you cited is the Xbox custom AMD chip for the either of the
24 Xbox DI products shown in the websites you reviewed, yes or
25 no?

1 A. I don't think so but I just -- I am not certain.

2 Q. Okay. Let's talk now about the Microsoft
3 Surface, Dr. Mody, the other product. Can we have RDX-9.4
4 up, please.

5 Microsoft Surface, now this is not a video-gaming
6 device, although it could be used as such. You agree with
7 me that the Surface laptop and the Surface Pro, these are
8 portable computers, right?

9 A. Yes.

10 Q. They are meant to be portable as opposed to
11 desktop computers? Is that fair?

12 A. Yes, I think that's fair.

13 Q. Okay. And I want to talk about the Surface
14 laptops at issue here. I would like CDX-36.10, please, up,
15 please.

16 There we go. Do you recognize these Surface
17 products, Dr. Mody? These are the Surface DI products that
18 Mr. Herrington relies upon. Do you see that?

19 A. I see those.

20 Q. We don't have the time to talk about all of them
21 today because the stopwatch will tell me otherwise. Do you
22 agree with me the article in commerce that you are pointing
23 to if I heard correctly is the integrated chipset that's in
24 each of these laptops. Is that fair?

25 A. It's the chipsets.

1 Q. The integrated chipsets?

2 A. That's -- it would be the CPUs, GPUs, the
3 chipsets, that's right.

4 Q. I want to be clear, each of these laptops, they
5 have integrated GPU, CPUs, correct?

6 A. In terms of made to work with the product, sure.

7 Q. And that word "integrated" has meaning, right?
8 Integrated means to combine one thing to become one whole,
9 right?

10 A. I am not sure what the definition is but I can
11 take your word for it.

12 Q. I have an advantage on you. I read Webster's
13 Dictionary this morning.

14 A. And I did not.

15 Q. All right. And these chipsets must be integrated
16 into the product in order to function, correct? Into the
17 Surface products in order to function?

18 A. There would be presumably expenditures
19 incorporating the chipset into the product. We haven't seen
20 those expenditures.

21 Q. Right.

22 A. But there would be expenditures associated with
23 incorporation.

24 Q. Okay. And you can't just simply swap out these
25 integrated chipsets in a laptop, can you? It takes a lot of

1 effort to do that integration, right?

2 A. I can't tell you about the effort that goes into
3 integrating chipsets.

4 Q. So is it not true that one would have to make a
5 significant expenditure of design and testing effort in
6 order to integrate a new GPU/CPU chipset into a laptop?

7 A. I -- I can't tell you that. It's not my area of
8 expertise. I just -- I can't tell you that.

9 Q. Could I have CX-8646 at page 85, paragraph 186,
10 please. Or footnote. There we go.

11 This is your rebuttal expert report, Dr. Mody.

12 And you say here that although the chipsets
13 within the accused products may be commoditized, I
14 understand that manufacturers cannot simply swap them out as
15 Mr. Dastmalchi suggests.

16 This is critical, Dr. Mody. I understand that
17 the chipsets must be integrated within the product.

18 A. Right. I understand from Dr. Saber, Schonfeld
19 and Storer, it's -- it's their testimony that I'm relying
20 on.

21 Q. Right.

22 A. I am just not a technical expert.

23 Q. Okay. I will skip ahead a bit.

24 Last question, Dr. Mody. I would like to talk to
25 you about the Surface Pro 3. That's one of the DI products.

1 Can I have CDX-36.10.

2 It is your opinion that all of these products
3 have off-the-shelf GPU/CPUs, correct?

4 A. I haven't heard any evidence otherwise.

5 Q. You haven't heard any record evidence otherwise?

6 A. I have not.

7 Q. Now, isn't it true that the Surface Pro -- I'm
8 sorry, the Surface laptop 3, that has a customized AMD chip,
9 does it not?

10 A. I -- I don't think that I've heard testimony
11 about -- from the technical experts about looking at a
12 customized AMD chip.

13 Q. Could I have CDX-36.8C, please.

14 Dr. Mody, this is the fact sheet for the Surface
15 laptop 3 and it says here "Surface laptop 3 15-inch brings a
16 larger display to the Surface laptop family with an elegant,
17 all metal design and strong graphics performance powered by
18 a custom AMD processor."

19 Do you see that, Dr. Mody?

20 A. I see that language.

21 Q. And you didn't review this document in your
22 opinion, did you?

23 A. I -- I don't know if I did or not. I just don't
24 know.

25 Q. Thank you.

1 MR. SWAIN: No further questions.

2 MR. BUI: No questions for the witness, Your
3 Honor.

4 JUDGE ELLIOT: Very well.

5 MR. JOHNSTON: And nothing further from
6 Respondents, Your Honor.

7 JUDGE ELLIOT: Very well. Dr. Mody, thank you
8 very much.

9 THE WITNESS: Thank you.

10 (The witness stood down.)

11 MS. ASCARRUNZ: Your Honor, Veronica Ascarrunz on
12 behalf of the Amazon Respondents. Respondents' next witness
13 will be Dr. Timothy Simcoe.
14 Whereupon--

15 TIMOTHY SIMCOE,
16 having been first duly sworn/affirmed, was examined and
17 testified as follows:

18

19 THE WITNESS: Yes, I do.

20 DIRECT EXAMINATION

21 BY MS. ASCARRUNZ:

22 Q. Good morning, Dr. Simcoe. Could you introduce
23 yourself to the ALJ.

24 A. Good morning, Your Honor. My name is Timothy
25 Sean Simcoe. I'm an economist and a professor at the Boston

1 University Questrom School of Business.

2 Q. And, Dr. Simcoe, did you prepare anything to help
3 you with your testimony today?

4 A. Yes. I prepared some slides for this testimony.

5 Q. And I understand your slides have some animations
6 that you prefer to control. Your Honor, may I pass the
7 remote control up to the witness?

8 A. Yes.

9 Q. Dr. Simcoe, if.

10 We could go to your slide 2. Could you give us a
11 brief overview of your background and experience?

12 A. Yes. I earned an applied math degree,
13 undergraduate degree in applied math with economics from
14 Harvard. A Master's in economics from the University of
15 California at Berkeley, and I earned a Ph.D. in business
16 administration from the University of California at
17 Berkeley.

18 Since that time I have worked as a Professor at
19 the Rotman School of Management at the University of Toronto
20 and at the BU Questrom School of Business where I am the
21 faculty director of the technology and policy and research
22 initiative. I'm also a research associate of the National
23 Bureau of Economic Research. I previously served as a
24 senior economist on the President's Council of Economic
25 Advisors. And I now chair the Strategy and Innovation

1 Department at BU.

2 Q. Does your work focus on any particular area?

3 A. Yes. I'm an industrial organization economist
4 who studies broadly the economics of innovation. I think
5 the body of research I'm best known for relates to the
6 economic impacts of standards and standard setting. That
7 includes a number of papers and studies related to standard
8 essential patents, licensing of those patents, and RAND
9 commitments.

10 MS. ASCARRUNZ: Your Honor, Respondents at this
11 point would like to tender Dr. Simcoe as an expert in
12 economics, standard setting organizations, FRAND licensing
13 and economic issues related to public interest.

14 JUDGE ELLIOT: Very well.

15 BY MS. ASCARRUNZ:

16 Q. Dr. Simcoe, did you also testify in the 1379
17 evidentiary hearing?

18 A. Yes, I did.

19 Q. All right. Let's turn to your next slide, slide
20 3. Could you summarize for us the opinions that you reached
21 in this case?

22 A. Yes. There are three. The first of those
23 opinions is that under the consensus economic view of what
24 would be appropriate remedies for infringement of a standard
25 essential patent, it is not appropriate to seek or grant

1 exclusionary relief unless some neutral authority has
2 established what terms would be reasonable and
3 non-discriminatory in the event of a dispute, and ensure
4 that an implementer has the ability to take a license on
5 those terms.

6 Secondly, it's my opinion that Nokia did not make
7 best efforts to disclose the asserted patents to the
8 relevant standard setting bodies in this case.

9 And, thirdly, it's my view that an exclusion
10 order is not in the public interest because of its impacts
11 on competitive conditions in the U.S. economy and U.S.
12 consumers.

13 Q. Thank you. So before we drill down into each of
14 these opinions separately, let's start with some principles.
15 Can you briefly describe and remind for us the purpose and
16 benefits of standards?

17 A. Yes. By standards what we mean here are
18 standards -- I am not sure this thing is working -- there it
19 goes -- standards for interoperability. For consumers, the
20 benefits of interoperability are sort of straightforward.

21 When I, for instance, write a document on my
22 computer and I wish to share it with a colleague, they are
23 often typically almost always able to open it and read it,
24 even if we use different word processors, different
25 operating systems, laptops made by different vendors with

1 different microprocessors in them.

2 Those benefits of interoperability just mean,
3 that products that are independently designed and
4 manufactured by different firms work together well and
5 consumers value that.

6 If we step back and we think about producers and
7 the economic impacts of standards, a key impact of standards
8 is that they reduce the costs of entry and production of
9 standardized components. So those components, when they are
10 lower cost and when they are lower costs of entry, there is
11 greater competition in the markets for supplying those
12 components, which leads to lower prices and increased
13 output.

14 That, in turn, makes it easy easier for the firms
15 that produce more complex products that incorporate those
16 components to innovate on top of standards and to produce a
17 greater variety of products. All of those are economic
18 benefits of standards.

19 Ultimately, when standards are widely adopted,
20 there is a process of upgrading them. So, for instance, we
21 went from 2G to 3G to 4G, to 5G cellular communications.
22 With each transition there is a wave of coordinated
23 industry-wide investment that produces a wide range of
24 economic benefits.

25 Q. So in the context of standards, what is the issue

1 of holdup?

2 A. Well, the holdup issue is a concern that the
3 owner of a patent that is necessarily infringed by a
4 standard may be able to charge unreasonably high royalties
5 and then -- which would prevent these benefits from
6 materializing.

7 But to understand holdup, it is really necessary
8 to have a notion of how a normal patent licensing market
9 works in the absence of a standard. And then we can
10 understand how the introduction of a standard changes sort
11 of the typical arrangement.

12 So the way economists think about this is that
13 any technology has a certain amount of economic value
14 associated with it. That economic value is the difference
15 between what a buyer is willing to pay for the technology
16 and what it would cost to produce that technology.

17 So here technology A just has the value which is
18 equal to the height of this bar. One might think that the
19 owner of a patent that needed to implement technology A
20 could charge up to the total economic value of it. But
21 that's not typically how we think prices are set.

22 In practice, there is usually competition that
23 determines how the value of any technology is allocated as
24 between users and producers. So imagine now there is a
25 technology B that produces the same amount of value as A.

1 And that those two things are substitutes.

2 In a market such as a licensing market someone
3 who sells A or licenses a patent needed to implement A might
4 try to set a price that captures the entire value of that
5 technology but if B is a reasonable substitute, a buyer
6 would rationally purchase B as long as the price of B was
7 incrementally less than A.

8 Of course then the seller of A would realize that
9 if B's price is only slightly below what A had previously
10 been charging, the seller of A could undercut B a bit, win
11 back the sale and so on and so forth such that in a market
12 with perfect competition, the price of both technologies
13 would be competed down to a level near marginal cost, but
14 that's not the end of the story either.

15 If one of the technologies produces more value,
16 for instance, B, then it has some incremental value relative
17 to A, and the owner of B could increase its price. It could
18 increase its price by up to the incremental value of B
19 without losing a sale and in that sense technology B, in a
20 licensing market, that incremental value could be captured
21 in royalties and we would think of those as reasonable
22 royalties associated with the incremental value of B.

23 This isn't simply something that I came up with.
24 This is sort of a standard economic model that has been
25 embraced, for instance, by the Sedona Working Group on

1 patent damages where they explain that total cost to an
2 accused infringer of implementing the next best commercially
3 acceptable non-infringing alternative can serve to cap a
4 reasonable royalty award.

5 Q. So this is the context without a standard. What
6 happens when you introduce a standard?

7 A. When you introduce a standard, again, we think of
8 the incremental value of B as the sort of the ex ante
9 reasonable royalty because ex ante is before the standard is
10 adopted. It's the time period before the market has
11 accepted the standard.

12 So after a standard is adopted, one thing that
13 happens is technology A then becomes a poor substitute for
14 technology B. Okay? If there is no ability for a user to
15 switch anymore because B is necessary to comply with the
16 standard, then the competition that I described between the
17 owner of A and B essential patents, that competition no
18 longer constrains price.

19 So it is possible for the owner of a patent
20 required to implement B could seek to charge royalties that
21 reflect not only the incremental value relative to
22 technologies that were available when we were creating this
23 standard, but also the value that would have flowed to
24 consumers in a normal licensing market because there is no
25 longer competition.

1 The other thing that happens when a standard is
2 created is that there are industry-wide investments in
3 implementation that give rise to the network effects or
4 interoperability benefits that I was discussing before. So
5 the value of the standard itself increases.

6 And without any competitive constraint, the owner
7 of a patent that is required to implement the standard can
8 seek to charge royalties that incorporate not the
9 incremental value of the technology that they brought when
10 that standard was being created, but the value that's
11 produced by widespread implementation of that standard in
12 the marketplace and the investments and implementation.

13 So now we can finally define what the holdup
14 problem is. The holdup problem is trying to charge
15 royalties that exceed the green slice in the middle of the
16 bar on the right side of this graph and capture some of the
17 value incorporated in the two red pieces. It's charging
18 royalties that exceed what would have been reasonable in a
19 licensing market where there was competition and capture the
20 value of the standard and the impacts of lost competition.

21 Q. So you refer to this as the holdup problem. Why
22 is holdup a problem? What are the costs?

23 A. Well, there are various costs associated with
24 holdup. One problem with holdup is that it threatens the
25 benefits of standardization, all of these network effects.

1 It increases the prices that I described as being lower
2 before and, therefore, reduces the benefits of standard
3 setting.

4 You can think of that problem in a different way
5 as distorting the balance of a normal licensing market or
6 the normal tradeoff in the patent system between the
7 benefits to users of a technology and the benefits to
8 inventors by creating patents that are stronger in the sense
9 that they face less competition and allowing for collection
10 of royalties that are tied to the value of investments and
11 implementation as opposed to the incremental value of the
12 technology.

13 We have something like a two-tier patent system
14 where SEPs are stronger. That in turn creates certain kinds
15 of costs that we economists call rent-seeking behavior.
16 Firms may seek to game either the patent prosecution process
17 or the standards developing process in an effort to acquire
18 a large pile of these stronger patents.

19 Q. What do you mean by rent-seeking behavior or
20 gaming?

21 A. Two types that I'm aware of that have been
22 discussed in the literature are sort of just-in-time
23 patenting. This is the idea that firms are participating in
24 the standard-setting process simply to sort of just jump
25 slightly ahead of where the development is going and patent

1 vary incremental technologies and generate a large stack of
2 SEPs.

3 A different kind of gaming or rent seeking
4 behavior might be using continuations or deferred patent
5 prosecution practices to draft claims that read on standards
6 long after those standards are adopted.

7 Q. Nokia in this case has suggested that holdup is
8 merely theoretical. Do you agree with that?

9 A. No, I do not.

10 Q. Why not?

11 A. Well, I think there's lots of evidence that
12 holdup is a real problem or a real concern. Probably the
13 best type of evidence is just the existence of
14 standard-setting organizations' intellectual property
15 policies.

16 If participants in standards development were not
17 concerned about holdup, they wouldn't go to the trouble of
18 drafting policies and rules that govern how these patents
19 must be disclosed or must be licensed after they become
20 essential to a standard.

21 A second type of evidence about holdup is
22 available from court cases. I have been involved in cases
23 where there was a dispute over what type of terms and
24 conditions for a license would be reasonable and
25 non-discriminatory, and in some cases, a court will set

1 royalties that the court believes are RAND that are
2 substantially below what the patent holder was demanding
3 when they entered into the litigation.

4 And a third type of evidence are simply
5 statements that are made by participants in the
6 standard-setting process and the standard essential patent
7 licensing ecosystem. It's clear from looking at statements
8 of practitioners that they believe holdup is a real problem.

9 Q. Do you have any examples of statements by
10 participants that you just referred to?

11 A. I do. Here is a set of statements made by Nokia
12 that indicate their understanding of holdup as a real
13 concern.

14 Q. And you said that the best evidence of holdup is
15 seen from the SSO IPR policies. How do the policies address
16 the issue of holdup?

17 A. The policies, they have broadly speaking two
18 means of trying to address the threat of holdup. The first
19 is that the policies put in place rules for disclosure.
20 Those are rules that require participants in the standards
21 development process to inform the other participants about
22 their patents as the standard is being developed so that
23 they can make better choices.

24 And when those disclosures happen, it triggers
25 the collection of licensing commitments. Licensing

1 commitments are the second prong of these policies. These
2 are rules that request from Patent Owner a commitment to
3 license their patents on at least reasonable and
4 non-discriminatory terms, which then ensures that all
5 implementers who wish to use the standard can gain access on
6 those terms.

7 Q. So for the standards at issue in this case, are
8 there specific SSO IPR policies that are relevant?

9 A. Yes. So, for instance, this document, JX-696 is
10 an excerpt from the patent policy that has been jointly
11 adopted by the ITU, the ISO, and the IEC, which are three
12 global standard-setting bodies. And it describes the rules
13 for intellectual property disclosure and licensing in the
14 context of those standards bodies.

15 Q. And are there any relevant policies for the
16 working groups at issue in this case, the JVT and the JCTVC?

17 A. Yes. So this slide illustrates the relevant
18 policies for the working groups, both JCTVC and JVT which
19 have terms of reference, the governing documents for those
20 working groups that themselves incorporate intellectual
21 property policies.

22 For JCTVC on the right, JX-903, illustrates that
23 they simply incorporated by reference the terms of the
24 common patent policy that I showed on the previous slide.

25 For JVT, which developed the H.264 standard, the

1 working group went a little bit further and adopted its own
2 rules for disclosure that required any participants
3 submitting a contribution to the working group to also
4 attach a patent disclosure form that lists the patents that
5 that participant knows may become essential to the standard.

6 Q. And what patents do IPR obligations apply to?

7 A. Licensing commitments apply to patents that are
8 essential. The policies define an essential patent as a
9 grant and/or pending application for a patent, the use of
10 which would be required to implement a standard. In the
11 literature, that's sometimes phrased as patents that are
12 necessarily infringed by a compliant implementation of the
13 standard, are essential.

14 Q. And does Nokia in this case assert that the
15 patents it's asserting are required to implement the H.264
16 or H.265 standards such that they would meet this
17 definition?

18 A. Yes. I have seen for both decoding claims and
19 encoding claims in the infringement contentions and
20 testimony, evidence that Nokia claims that because the
21 products implement the standards, they necessarily infringe
22 Nokia's patents.

23 Q. Okay. So let's turn to slide 12 and back to your
24 summary of opinion slide.

25 What is your first opinion?

1 A. My first opinion related to the notion of what
2 type of remedies would be appropriate under the economic
3 view of fair, reasonable, and non-discriminatory in the
4 event that a standard essential patent is found to be
5 infringed. We can think about two implications.

6 One is that economists view FRAND as a
7 substantive commitment as opposed to merely a promise to
8 negotiate, so that FRAND commitments create an obligation to
9 license at an actually reasonable rate.

10 Secondly, the economic view of FRAND speaks to
11 what would be appropriate remedies. In particular, it
12 illustrates why threats of exclusion will lead to holdup,
13 will overcompensate SEP owners relative to the value of the
14 patented technology.

15 Q. You referred to FRAND commitments. How does a
16 Patent Owner make a licensing commitment?

17 A. They enter into a licensing commitment typically
18 by filling out a form, which is provided as part of the
19 standards body's intellectual property policy and checking a
20 box on that form. So here is the relevant section of the
21 form for the ITU, ISO, IEC common policy. And a patent
22 holder that selects box Number 2 has made a RAND licensing
23 commitment.

24 Q. And are the licensing commitments any different
25 for the JVT or JCTVC?

1 A. Not substantively different.

2 Q. Okay. So when you talk about offering FRAND
3 terms, what exactly is FRAND or RAND?

4 A. So, again, economists view FRAND as a royalty --
5 or the reasonable part of FRAND, I should say, as a royalty
6 that does not incorporate holdup. It's a royalty that is no
7 greater than the incremental value of the patented
8 technology relative to acceptable alternatives that were
9 available at the time the standard was being set. It
10 doesn't capture the two red bars, if you go back to my
11 previous testimonies about what the holdup problem is.

12 Q. Are you saying that for every patent in every
13 standard it's necessary to calculate that incremental value?

14 A. No. I am not saying that we have to develop a
15 valuation methodology that goes patent-by-patent, calculates
16 incremental value and somehow adds that up. What I'm saying
17 is that the economic view of what these commitments means,
18 they provide a conceptual framework that helps us understand
19 how to approach the problem of determining what are RAND
20 terms and conditions in the event of a dispute.

21 Q. You referred to this as a consensus economic
22 view. Do you have any examples of support for saying that
23 the consensus economic view relates to ex ante incremental
24 value?

25 A. I do. I have cited to a number of articles by

1 economists and attorneys who work in this area that support
2 that view. So, for instance, the top left box, this is a
3 handbook article authored by Jorge Contreras, who is a law
4 professor at Utah, who is an authority in this area and Anne
5 Layne-Farrar, who is an economist, who has previously worked
6 as an expert for Nokia, where they say: General consensus
7 has emerged that a good benchmark for what a FRAND rate is
8 for a given set of SEPs is the licensing fee and related
9 terms and conditions that those patents could have commanded
10 during the development of the standard, when they were
11 likely competing with other technologies for inclusion in
12 the standard. Thus, competition and lack of any possible
13 technology lock-in render these early refiles reflective of
14 market valuations and are free of holdup costs.

15 Q. And you're referring to the article cited on your
16 slide 15?

17 A. That's correct.

18 Q. Have any non-economists or non-academics adopted
19 this economic view?

20 A. Yes.

21 Q. Looks like we're having trouble with the control.
22 Can we have a separate one?

23 A. So I think that the economic view is reflected in
24 the Federal Circuit's Ericsson versus D-Link decision where
25 they say that a RAND commitment limits the market value of

1 what a Patent Owner can reasonably charge for use of the
2 patented technology.

3 In other words, it's not simply an exercise of as
4 much market power as I may have in the market today, it's a
5 substantive limit that somehow links the value of the
6 patented technology to the RAND licensing terms.

7 There is another quote here from an amicus brief
8 submitted by Nokia that I think embraces the same economic
9 perspective.

10 Q. Did you hear Dr. Akemann testify on Tuesday?

11 A. I did.

12 Q. Do you agree with his testimony that there's no
13 inconsistency between trying to maximize profits on the one
14 hand and RAND obligations on the other?

15 A. I did hear that testimony. I disagree with it
16 strongly.

17 Q. Why is that?

18 A. Two levels. So, first, I think sort of pointing
19 to an equivalence between RAND licensing and unconstrained
20 profit maximization, just begs the question of why the
21 standards bodies went to the trouble of drafting policies
22 that are explicitly described in terms of constraining what
23 patent holders can do.

24 But, again, the existence of the policies is
25 evidence that they are expecting there to be some constraint

1 on the prices charged and the conduct of the parties in SEP
2 licensing.

3 I think at an even more broad level, you can
4 think of there being in any market, there are always sort of
5 rules and regulations that serve as guardrails on the
6 conduct of parties in that market.

7 Economists are good at sort of articulating how
8 those rules and guardrails may lead to socially productive
9 outcomes under conditions of profit maximization, but to
10 simply sort of skip the rules and the guardrails and jump
11 right to the conclusion that profit maximizing behavior is
12 socially beneficial without thinking of under what
13 conditions, I think it is misleading.

14 It may suggest that conduct such as approaching a
15 regulator or a Court arguing to remove the guardrails is
16 socially productive. And I don't think there is any
17 evidence from economics that that's the case.

18 Q. Does the economic view of RAND that you have set
19 forward and that you indicated had been accepted and
20 acknowledged by Nokia and others have any implications on
21 analyzing evidence from licenses?

22 A. Yes. So I think there are several implications
23 of the economic perspective for thinking about licensing
24 evidence. One implication is that we can't presume licenses
25 are necessarily FRAND, simply because they exist.

1 One needs to look at the bargaining environment,
2 the conditions under which a license was negotiated as one
3 would do with any allegedly comparable license, to assess
4 whether the bargaining environment was conducive to holding
5 up an implementer or not.

6 One relevant piece of the bargaining environment
7 that you can look at is timing. So going back to sort of my
8 explanation of how holdup arises, an important part is that
9 the industry implements the standard and as that -- the
10 standard becomes more widespread, the benefits grow. And
11 the industry becomes locked in.

12 So negotiations that take place when there is
13 some kind of competitive constraint from alternatives that
14 might become widely adopted in the market, those can be more
15 useful as a RAND benchmark than negotiations that take place
16 when everyone is locked into the standard.

17 Q. So there is a dispute in this case about whether
18 it's more appropriate to look to pool licenses or Nokia's
19 existing licenses. Can you explain what the differences are
20 between looking at those two different types of evidence?

21 A. There are many differences. I testified about
22 this at some length in the 1379 investigation. So let me
23 quickly try to highlight a couple.

24 So I already spoke about timing. Another thing
25 to keep in mind when considering pools as a RAND benchmark

1 versus licenses is that one might be misled into thinking
2 that the pool is only a single license, but if you think
3 about the number of transactions, a successful pool that has
4 many licensors and many licensees in it, you know, you could
5 think of that as a very, very large number of licensing
6 transactions such that, you know, sort of a large stack of
7 allegedly comparable agreements may still be much smaller
8 than a single pool agreement.

9 And the other point I would emphasize is the
10 difference in transparency between these two. So typically
11 a patent pool has terms and conditions that are publicly
12 accessible. So an implementer that is considering taking a
13 license from a pool understands what the terms and
14 conditions of that license are and it also understands what
15 are the terms and conditions of other participants in the
16 pool, what they are getting.

17 Agreements that are negotiated bilaterally are
18 typically negotiated subject to nondisclosure provisions.
19 Those nondisclosure provisions make it very, very hard for a
20 prospective licensee to understand if they are being
21 discriminated against or not, whether the terms and
22 conditions that are provided in representations by an SEP
23 licensor give a complete picture.

24 And so it becomes just extremely difficult to
25 assess in a negotiating context whether bilateral agreements

1 provide the type of evidence that would be reliable. One
2 more point on that, I should say, is that if a licensor,
3 prospective licensor, understands that it's going to try and
4 rely on its bilateral agreements and knows that those
5 agreements are being negotiated under NDAs, it can have both
6 the incentives and the ability to sort of try and manage
7 that evidence, for instance, by negotiating first with
8 smaller or weaker licensees who will agree to terms because
9 they never expect to pay very much or because they are
10 involved in some other kind of unrelated dispute with a
11 licensor that leads them to accept some term just to kind of
12 get the thing closed.

13 Q. Are you aware of any finding that relates to or
14 acknowledges that the patent pools at issue in this case can
15 be informative?

16 A. At the bottom of this slide there is a quote from
17 the Microsoft versus Motorola decision. I was involved in
18 that case where the Court evaluated or compared both
19 bilateral agreements and pools as potential RAND benchmarks.
20 The and Judge Robart found that for the H.264 MPEG LA pool
21 that was an indicator of a RAND rate.

22 Q. Has Nokia ever spoken to whether patent pools are
23 looking to that evidence can be informative?

24 A. Nokia has said that pool rates can be
25 informative. In fact, on their website they published this

1 statement, in response to the question: How can I, a
2 prospective licensee, assess what might be a fair and
3 reasonable license?

4 They say that a complicating factor is that
5 licenses are often subject to confidentiality provisions and
6 so not available to third parties. That's the transparency
7 point I was just talking about.

8 And they say you could look to publicly-available
9 market data. And among the types of market data they point
10 to are public announcements on royalties by patent pools.

11 Q. Does Nokia itself participate in any pools?

12 A. Yes. Nokia participates in pools as both
13 licensor and licensee.

14 Q. In this case, there has been an argument that
15 large and sophisticated companies are not susceptible to
16 holdup. Do you agree with that?

17 A. No, I don't.

18 Q. Why not?

19 A. I think it conflates a couple of factors. The
20 argument typically proceeds by sort of saying: Look, large
21 companies are able to enter into litigation and therefore
22 they can't be held up. But those are two questions. I
23 would agree with the proposition that when there is a lot of
24 value at stake, and the parties who have a dispute over what
25 is RAND have the resources required to litigate, that

1 litigation becomes more likely.

2 So that's a correct proposition. We may be more
3 likely to see large firms in court when there is a dispute
4 over RAND.

5 But the question of whether the firm can be held
6 up or not really depends on the outcome of the litigation.
7 So if the outcome of the litigation is that the choice faced
8 by a large firm is either to sort of have its product
9 removed from the market or take whatever terms are made
10 available subsequent to the litigation, they may very well
11 be held up.

12 Q. Let's turn to your slide 20 and back to your
13 economic perspective on RAND.

14 What does that tell us about what remedies should
15 be available? Let's advance to slide 20, Mr. Sayres.

16 A. So the basic point that emerges from thinking
17 about RAND under this consensus economic view, is that
18 seeking or granting exclusionary relief before establishing
19 what is a RAND rate providing an opportunity for an
20 implementer to accept a license on those terms will lead to
21 holdup.

22 Q. Do you have any support for the conclusion that
23 seeking exclusionary remedies could lead to holdup?

24 A. Yes, I do. So here, you know, sort of two
25 authorities or articles by two sets of authorities embracing

1 this point. So on the left, Tom Cotter, who is a professor
2 of law at Minnesota, who has written a case book on patent
3 damages, talks about the touchstone of patent holdup being
4 that the patentee can use an injunction to extract a royalty
5 that reflects not the ex ante value of the patent but also
6 the costs that an infringer would face in trying to
7 design-around and explains why that is a deadweight loss.

8 On the right is an article by a group of four
9 economists, among them are two who have served as the chief
10 economist at the Department of Justice and the chief
11 economist at the U.S. Federal Trade Commission where they
12 say our interpretation implies that a patent holder that has
13 made a commitment to license on a FRAND basis should not be
14 able to get or threaten an injunction against the use of the
15 technology to comply with the standard.

16 Q. What about Nokia, has Nokia made any statements
17 about seeking exclusionary relief in the context of ITC
18 investigations?

19 A. Yes. Nokia has submitted public interest
20 statements in ITC investigations taking the view that
21 exclusion orders should not be available against willing
22 licensees. You can see it as the subheading in the top left
23 quote here where they say a RAND commitment precludes a
24 party from seeking an exclusion order against a willing
25 licensee.

1 Q. So if that statement that you pointed out, that a
2 RAND commitment precludes a party from seeking an exclusion
3 order against willing licensees is right, how do we
4 determine willingness?

5 A. You know, I think the simplest way to determine
6 willingness, consistent with this perspective is to resolve
7 a dispute over what are FRAND terms and conditions, set the
8 terms, and then provide an opportunity for an implementer to
9 enter into a license on those terms.

10 If they take a license on terms that have been
11 adjudicated to be RAND, they are a willing licensee.

12 Q. For the Respondents in this case are you aware of
13 any facts that speak to whether or not Amazon and HP are
14 willing licensees?

15 A. Yes.

16 Q. What are those?

17 A. Well --

18 Q. Actually let me stop and ask you, let's go
19 individually. What have you found with respect to HP?

20 A. HP is committed to take a license on terms that
21 are determined to be FRAND by the District Court of Delaware
22 in litigation that is ongoing.

23 Q. And what about for Amazon?

24 A. Similarly, Amazon has committed to
25 unconditionally license Nokia's SEPs on terms that are

1 established as RAND by a court in the United Kingdom and
2 Amazon has also sought to have that rate determination
3 expedited.

4 Q. What did the U.K. court do in response to
5 Amazon's request to have that determination expedited?

6 A. The Court agreed. So here RX-5320, is an excerpt
7 from the decision of the U.K. court where they provide their
8 explanation. They say that the continuing and increasing
9 risk of harm by reason of Nokia's campaign of enforcement
10 action in other jurisdictions demonstrates a sufficient need
11 for urgency and expedition.

12 And they say that in the absence of a mechanism
13 for holding the Ring between the parties pending the
14 resolution of terms of a RAND license, the only tool that
15 they have available is to ensure speedier resolution of the
16 case.

17 Q. Thank you. So let's go to your slide 25 and back
18 to your summary.

19 Could you summarize what your second opinion on
20 disclosure is?

21 A. Yes. It is that Nokia did not make best efforts
22 to disclose it's IPR, the asserted patents, to the ITU, JVT,
23 and JCTVC.

24 JUDGE ELLIOT: Let me jump in here.

25 Ms. Ascarrunz, how much time do you think you

1 will take on this particular part?

2 MS. ASCARRUNZ: We have probably about ten
3 minutes left, 15 minutes.

4 JUDGE ELLIOT: All right. Let's finish up and
5 then we will take our lunch break.

6 BY MS. ASCARRUNZ:

7 Q. Dr. Simcoe, can you explain where the ITU sets
8 out its disclosure rules?

9 A. So in the first paragraph of the common patent
10 policy where there is some yellow highlighting in the center
11 of this slide, the ITU explains that it desires the fullest
12 available information to be disclosed from the outset of the
13 standard-setting process and, in particular, that parties
14 draw attention to any known patents or pending patent
15 applications.

16 And then there are guidelines associated with the
17 intellectual property policy that provide interpretation of
18 this first paragraph. Those are extracted here on the right
19 side of the slide. And they say that from the outset in
20 this context means information should be disclosed as early
21 as possible during the development of the standard. And
22 that that information should be provided in good faith and
23 on a best effort basis, but without any requirement for
24 searching for patents.

25 Q. And are there any JVT or JCTVC policies that are

1 relevant to disclosure?

2 A. Yes. They do have policies that are similar. So
3 the JCTVC incorporates the common patent policy terms by
4 reference. The JVT goes a little further in its terms of
5 reference and indicates that any firm that submits a
6 contribution to the standards development process is
7 required to fill out a disclosure form and disclose its
8 known patents or pending patent applications.

9 Q. Is there any economic rationale for these
10 requirements in the policies?

11 A. Yes, generally economists believe that more
12 informed choices lead to better outcomes. An economic
13 rationale for these disclosure rules is to make participants
14 and standards development better informed about the
15 technologies that they may choose to include or exclude from
16 the standard and help them develop expectations about the
17 licensing costs when they go to implement.

18 Q. Okay. Let's look at the patents that have been
19 asserted specifically in this investigation and turn to your
20 slide 28.

21 As it relates to -- well, let me ask first by
22 asking you, what are you trying to demonstrate on this
23 timeline?

24 A. This timeline has many events on it. I am trying
25 to lay out the timeline for several kinds of things. So in

1 the purple font are events related to disclosure of patents
2 or offering of licensing commitments. In the black font are
3 events related to the technical standard setting process
4 itself, submission of contributions or approval of the
5 standard.

6 And below in green font are events related to the
7 prosecution of the '321 patent.

8 Q. So I see two events highlighted in yellow on the
9 far left for January 23rd, 2002. What are those events?

10 A. On January 23rd, two things happened. One is
11 that Nokia submitted a technical contribution to JVT. The
12 author of that contribution was Mr. Hannuksela. On the same
13 date in 2002, Mr. Hannuksela was the named inventor on the
14 first priority document for the '321 patent. The
15 commonality there of Mr. Hannuksela, is the inventor and the
16 author speaks to Nokia's knowledge about the pending patent
17 applications.

18 Q. And did Nokia disclose those pending patent
19 applications to the SS0 before the standard was approved?

20 A. They did not. In October of 2002, Nokia
21 disclosed the existence of other patents and pending patent
22 applications but none relating to the '321 application.
23 Then what the red bar on this graph shows is that there was
24 a four-year delay between the approval of the H.264
25 recommendation and the first disclosure of the '321 patent

1 to the relevant standard setting organizations or I should
2 have said the patent application.

3 Q. And where on the sequence of events shown on your
4 timeline did Nokia file the application that ultimately
5 issued as the '321 patent?

6 A. That's illustrated using yellow highlighting
7 below the timeline. So on January 25th, 2006, Nokia filed a
8 continuation application. And that continuation contains
9 the claims that are being asserted here as the '321 patent.

10 This is an example of something I discussed
11 earlier, where the continuation contains claims that are
12 filed after the standard itself has been approved and
13 finalized.

14 Q. So let's turn to your slide 29. And now address
15 the '818 patent.

16 Did you find any similarities or what was your
17 conclusion with respect to Nokia's disclosure for the '818
18 patent?

19 A. I found a number of similarities. Again, for the
20 '818 patent, the authors of the contribution that Nokia
21 alleges is how it's patented technology entered the standard
22 are the same as the named inventors on the patent, which
23 speaks to awareness of the existence of these patent
24 applications.

25 Again, there was no disclosure of the pending

1 applications prior to the approval of the H.264 standard and
2 there was a roughly seven-year delay between the approval of
3 the standard and the ultimate disclosure of the '818 patent.

4 Q. Let's turn to your slide 30. And now address the
5 '714 patent. What did you find with respect to Nokia's
6 disclosure you were for that patent?

7 A. For the '714 patent, again, there was a pattern
8 where the inventors on the first priority document for this
9 patent filed the priority documents and then a contribution
10 with the same inventors as the authors was submitted to
11 JCTVC a few weeks later.

12 Again, the pending applications were not
13 disclosed prior to the approval of the H.265 recommendation.
14 And in this case there was a long string of continuation
15 applications before the final continuation filed in March
16 2019, maybe six years after the standard was approved, that
17 eventually issued as the '714 patent.

18 Q. Let's turn to slide 31 in the '991 patent. What
19 did you find here?

20 A. The '919 patent is slightly different because in
21 this case the allegation is that the content of the patent
22 entered the standard through a submission by MediaTek.
23 Nokia had filed its first priority document for this patent
24 in 2007 and the patent itself issued in 2011 prior to the
25 approval of the H.265 recommendation.

1 The patent was not disclosed prior to the
2 approval of H.265 and there was a lag of roughly three years
3 before the declaration form listing the '991 patent was
4 submitted in 2016.

5 Q. Then let's turn to the last patent in the '267 in
6 slide 32. What did you find with respect to the '267
7 patent?

8 A. For the '267, again, there's the inventors on the
9 patent are the same as the authors of the relevant technical
10 contributions submitted to JCTVC. Those two events happened
11 eight days apart.

12 The patent applications were not disclosed prior
13 to the approval of the 265 recommendation and there was a
14 20-month lag between the approval and the declaration -- the
15 disclosure of the '267 patent. And there was a string of
16 continuation applications that led to a continuation filing
17 in 2021 that eventually issued as the '267 patent.

18 Q. So the application that led to the '267 patent
19 was filed roughly ten years after the contribution Nokia
20 made to the SS0?

21 A. That's correct.

22 Q. And the last date that I see on this timeline is
23 October 31, 2023. What happened on that date?

24 A. Two things happened on October 31st, 2023. One
25 is that the '267 patent issued. And the other is that this

1 investigation was filed.

2 Q. Okay. Let's go back to slide 36 and your summary
3 of opinions slide again, your last one. What opinion did
4 you reach with respect to the public interest?

5 A. That an exclusion order would not be in the
6 public interest because of its impact on competitive
7 conditions in the U.S. economy and on U.S. consumers.

8 Q. So you just mentioned U.S. competitive conditions
9 and U.S. consumers. Can you explain what the benefits are
10 of the things we have been talking about today, standards,
11 disclosures, and RAND obligations as it relates to
12 competitive conditions and U.S. consumers?

13 A. Yes. This just brings us back to the very first
14 point in my testimony, which is that standards are
15 beneficial. They lead to entry in competition, lower
16 prices, increased output, social welfare in the markets for
17 standardized components. That leads to innovation and
18 product variety in the complex products that incorporate
19 those components.

20 They reduce coordination costs, generate
21 economy-wide, you know, economies of scale or I should say
22 industry-wide economies of scale.

23 And so all of those benefits derive from a
24 well-functioning standards process in which RAND commitments
25 are enforced. That also promotes the diffusion of standards

1 which provides benefits for consumers in the form of
2 interoperability, greater product variety, lower prices.

3 Q. Have these economic benefits ever been assessed
4 in the context of the ITC statutory factors that go to
5 competitive conditions in the U.S. economy and U.S.
6 consumers?

7 A. Yes. In the investigation where an exclusion
8 order was issued against Apple devices, the U.S. trade
9 representative's disapproval of that exclusion order
10 characterized the reasons for that disapproval in terms of
11 the benefits of standardization and, conversely, the costs
12 to U.S. consumers and competitive conditions in the economy
13 associated with issuing exclusion in that case.

14 Q. So taking into consideration the economic
15 principles you have talked about today, the facts in this
16 case and your opinions, have you reached any opinion about
17 what the impact would be of an exclusion order against
18 Amazon and HP as it relates to the public interest?

19 A. In my view, it would be against the public
20 interest to issue an exclusion order because issuing an
21 exclusion order without providing a resolution of what RAND
22 terms and conditions would be in the dispute between these
23 parties and guaranteeing that implementers can show that
24 they are willing to accept a license by entering into a
25 license on those terms, we threaten the benefits associated

1 with standard setting.

2 It would lead to excess leverage in bargaining
3 and it would provide greater rewards to SEPs than non-SEPs
4 and I think it would undermine the types of benefits of
5 standardization I talked about just a moment ago and have
6 detrimental effects on consumers and competitive conditions.

7 MS. ASCARRUNZ: Thank you, Dr. Simcoe. I pass
8 the witness.

9 JUDGE ELLIOT: Very well. How long do you expect
10 to be?

11 MR. STEVENSON: Your Honor, I have been budgeted
12 25 minutes. And I intend to stay within that budget to the
13 letter.

14 JUDGE ELLIOT: Very well. I am glad to hear
15 that. Let's take our lunch break. I have 12:24. Let's
16 come back at 1:40, 1:40. And, sir, during our break, please
17 don't discuss your testimony with anyone.

18 (Whereupon, at 12:24 p.m., a lunch recess was
19 taken.)

20

21

22

23

24

25

1 A F T E R N O O N S E S S I O N

2 (1:40 p.m.)

3 JUDGE ELLIOT: Have a seat.

4 All right. Mr. Stevenson.

5 MR. STEVENSON: Thank you, Your Honor. May I
6 proceed? We will have to begin with the new period of time
7 on the confidential record --

8 JUDGE ELLIOT: Very well.

9 MR. STEVENSON: -- as to HP and Nokia
10 information, which means Amazon representatives will have to
11 excuse themselves.

12 JUDGE ELLIOT: Very well.

13 (Whereupon, the hearing proceeded in confidential
14 session.)

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 BY MR. STEVENSON:

3 Q. All right. Dr. Simcoe, you talked a little bit
4 -- or, actually, a fair amount about essentiality and the
5 RAND commitment. I want to understand from you a couple
6 things. First, you understand that when companies declare
7 patents by patent number to ITU, that doesn't mean they're
8 necessarily actually essential, correct?

9 A. Yes. A declaration does not necessarily imply
10 essentiality.

11 Q. Okay. Are the Respondents taking the position
12 that the Nokia decoding claims that are being asserted in
13 this investigation are actually essential to the H.264 or
14 H.265 standards?

15 A. My understanding is that Respondents believe the
16 patents are not infringed and that the lack of infringement
17 would make the patents not essential.

18 Q. Thank you. Let's talk now about your experience
19 with the subject matter that you're talking about. Now, is
20 it fair to say you've never been to an ITU meeting?

21 A. That's correct.

22 Q. You've never attended a JVT meeting, correct?

23 A. Yes.

24 Q. You've never attended a JCTVC meeting, correct?

25 A. That's correct.

Heritage Reporting Corporation
(202) 628-4888

1 Q. You weren't involved in drafting any of the ITU
2 guidelines related to IP rights?

3 A. No, I did not draft any of the guidelines.

4 Q. You weren't involved in drafting any of the
5 patent declaration forms that we're looking at in this case
6 that have been entered into and submitted by Nokia, right?

7 A. I have studied these topics for 25 years and have
8 deep familiarity with them, but I wasn't involved in the
9 creation of any of these things.

10 Q. Okay. And no involvement in drafting the patent
11 disclosure form for JVT, correct?

12 A. Correct.

13 Q. And in forming your opinions, you didn't talk to
14 anybody who was involved in drafting those forms for ITU or
15 JVT or JCT, correct?

16 A. I don't think that's exactly correct.

17 Q. Well, let's look at your deposition in 1380.

18 Can we have Dr. Simcoe's deposition at page 91,
19 line 17, to 92, line 2?

20 Do you remember providing your deposition in this
21 investigation, Dr. Simcoe?

22 A. Yes.

23 Q. Were you asked the question under oath, "And just
24 so the record is clear, you have not spoken to any people
25 involved in drafting the policies at issue in this

1 investigation, right?

2 "Answer: To my knowledge, I haven't done so.
3 Although, it's possible I did in some other context. I did
4 not approach anyone in the context of formulating my
5 opinions in this matter to have such a conversation."

6 Was that your sworn testimony?

7 A. So I understood your question to be asking if
8 I've spoken to people who drafted or submitted those forms.
9 I think it's likely I have, as I testified in my deposition,
10 in other contexts, but it's not something I did specifically
11 for my work in this matter.

12 Q. This was your sworn testimony, correct, sir?

13 A. Correct.

14 Q. Let's turn to your experience in this particular
15 area. Prior to being retained in this case, you've never
16 offered opinions before on the JVT patent policy, have you?

17 A. I think that's correct. I've worked on a matter
18 related to the ITU policy and the H.264 standard, but I
19 don't recall delving into the JVT policy specifically.

20 Q. And, in fact, prior to this case, you had never
21 even seen the JCT terms of reference, had you?

22 A. I'm not sure.

23 Q. And prior to this case, you've never offered any
24 opinions on what information is required to be contained in
25 a ITU patent declaration form, correct?

1 A. I'm not certain. As I said, I worked on another
2 matter that's related to the ITU patent policy. My
3 recollection of that matter is that it focused on a
4 different set of issues than what's required on the forms,
5 but I couldn't say for certain.

6 Q. So there's five patents being asserted in this
7 case, correct?

8 A. Yes.

9 Q. Four of them related to technologies for which
10 Nokia submitted the contribution to the ITU and, in
11 particular, the JCT, correct?

12 A. Yes, that's my understanding.

13 Q. Can we have slide 8, please.

14 And these are the four contributions, JX-475,
15 JX-474, JX-458, and JX-456. Does that ring a bell?

16 A. I -- yes, I suppose those are four of the
17 contributions. I think in some cases there are multiple
18 contributions. You know, I would stipulate to these being
19 relevant contributions.

20 Q. These get submitted during technical working
21 group meetings, correct?

22 A. Yes. If these are the contributions, then during
23 technical working group meetings, they would be submitted.

24 Q. And you weren't present for any of these working
25 group meetings, right?

1 A. That's correct.

2 Q. And in your testimony, you have not identified
3 any competing contributions to the Nokia contributions that
4 may have been submitted by other companies, correct?

5 A. That was not something I was asked to look for,
6 no.

7 Q. Okay. Let me talk with you now a little bit
8 about causation.

9 In your report, you cited to the Core Wireless
10 versus Apple case, didn't you?

11 A. I'll take your word for it. I don't recall what
12 the context of that citation was.

13 Q. Well, I don't want you to take my word for it.
14 Let's put up slide 9.

15 This is your expert report in this matter.
16 Footnote 137, Do you see your citation to Core Wireless?

17 A. Yes.

18 Q. And I commend you on your adherence to Bluebook
19 form.

20 A. Thank you.

21 Q. Yes. You're welcome. Now, that was a case of
22 implied waiver, wasn't it?

23 A. Sorry? I was looking at the context.

24 Q. The case you cited was a case of implied waiver,
25 correct?

1 A. I was trying to understand what the citation was
2 about, but I think, yes, there was an issue of implied
3 waiver. Certainly, that was in the footnote.

4 Q. Right. That was a case where a differently
5 worded IPR policy, the ETSI IPR policy, was at issue,
6 correct?

7 A. Yes, I think so.

8 Q. And in that case, Core Wireless, the Federal
9 Circuit held that to render unenforceable a patent for
10 implied waiver, it requires more than just proof of late
11 disclosure, correct?

12 A. Again, I don't recall what standard exactly the
13 Federal Circuit established for implied waiver there.

14 Q. Let's look at slide 10, please.

15 Did you read the Core Wireless case before citing
16 it in your report?

17 A. I read certainly portions of the Core Wireless
18 case, yes.

19 Q. Okay. Did you read the portion that says, "an
20 equitable defense will not be recognized if the offending
21 party did not gain a benefit from the wrongdoing"?

22 A. It's possible.

23 Q. And you understand, Dr. Simcoe, that the Federal
24 Circuit has said -- and if we could go to the very next
25 slide in the same case -- that you can't render a patent

1 unenforceable merely because of misconduct lurking somewhere
2 in the past? Is that a fair statement?

3 A. That seems to be what it says, yes.

4 Q. And so if we go to the next slide, slide 12, the
5 Federal Circuit requires proof of either prejudice or
6 egregious misconduct to render a patent unenforceable,
7 doesn't it?

8 A. Again, I'll take your word for what's in the
9 decision.

10 Q. Okay. Let's talk about egregious misconduct
11 first.

12 Fair to say you haven't seen any evidence in this
13 case that Nokia intentionally concealed its patents from the
14 ITU. Fair?

15 A. My analysis focused on whether they were making a
16 their best efforts to affirmatively disclose the patents.
17 But I think it's fair to say that I don't have evidence of
18 intentional concealment.

19 Q. And that's from the ITU or the JVT or the JCT,
20 correct?

21 A. Yes.

22 Q. And you're not offering any testimony that Nokia
23 had an intent to conceal. Fair?

24 A. I don't have any view on Nokia's intent.

25 Q. Okay. Let's move on to the other prong of that

1 test, prejudice.

2 So you have not opined, have you, that but for
3 Nokia's alleged failure to timely disclose, that the JCT or
4 the JVT would have selected a different unpatented
5 contribution. Fair?

6 A. It depends.

7 Q. You didn't opine to that in your direct
8 testimony, did you?

9 A. Would you repeat the question?

10 Q. Yes. In your direct testimony, you didn't opine
11 that but for Nokia's alleged failure to timely disclose, the
12 JVT or the JCT would have selected a different unpatented
13 contribution?

14 A. Yes, that's correct.

15 Q. Or that it would have selected a different
16 royalty-free contribution, correct?

17 A. That's correct.

18 Q. In fact, you've offered no opinion whatsoever as
19 to whether the H.264 or the H.265 standard would even be
20 different had Nokia made an earlier disclosure of its
21 patents. Fair?

22 A. I did not attempt to construct a counterfactual
23 standard-setting process that had made assumptions about
24 differences in Nokia's disclosure efforts to analyze what
25 the standard would have looked like in the end.

1 Q. And you don't have any opinion and you've offered
2 no testimony about why the JVT participants actually
3 selected Nokia's contributions for inclusion in the standard
4 for H.265 in the first place. Fair?

5 A. Yes, I did not analyze the questions of whether
6 they were incorporated, if they were incorporated, or why.

7 Q. Okay. And, in fact, Nokia told the entire ITU
8 from the beginning that for any contributions it submitted,
9 it would license related patents on RAND terms, didn't it?

10 A. It made what's called a general licensing
11 declaration.

12 Q. It said it would be RAND, didn't it?

13 A. Yes. So the licensing declaration is different
14 from a patent disclosure.

15 Q. And you've testified before and you've written
16 articles that there's -- blanket declarations are perfectly
17 acceptable within the rules of the ITU, correct?

18 A. Again, I wouldn't want to conflate licensing
19 commitments with patent disclosures, but blanket licensing
20 commitments are perfectly acceptable, yes.

21 Q. In fact, isn't it true that the vast majority of
22 ITU declarations, about 68 percent, are blanket
23 declarations, like Nokia submitted?

24 A. When firms are not aware of the patents that they
25 own, they are encouraged to make these blanket declarations,

1 and I think 68 percent is the number that came up in the
2 1379 investigation from a paper that I wrote.

3 Q. So let me ask you -- let's go through a concrete
4 example of how this works in the real world. Let's look at
5 the '267 and '714 patents in this case.

6 Now, I wrote down your testimony. And I think
7 you said, for the '714 patent, that the pending patent
8 application was not disclosed by Nokia before the H.265
9 standard was approved. Was that your testimony?

10 A. So I would love to look at the timelines because
11 I don't recall -- you know, there were five patents, and the
12 history of each was complicated. But I suspect you're
13 giving me my -- you know, some representation of my
14 testimony.

15 Q. Well, is that your testimony or not your
16 testimony?

17 A. So which patent?

18 Q. '714.

19 A. Yeah, I believe it's the case that the '714's
20 pending patent application was not specifically disclosed.

21 Q. And you said that for the '267 patent as well,
22 didn't you?

23 A. I believe that's correct.

24 Q. Okay. But that's actually not true, is it, sir?
25 Can we have slide 21.

1 I'm showing you JX-456 and JX-458. Those are the
2 contributions that Nokia made for the '267 and '714.

3 Isn't it true that Nokia in its contribution in
4 that same document identified and disclosed it may have
5 patent rights?

6 A. That's not -- they did not disclose the patent
7 applications. This is a statement that they may have
8 patents or pending patent applications.

9 Q. Okay. So is it your testimony that you break the
10 rules if you don't write the application number down in your
11 contribution? Is that what you're telling us?

12 A. It depends on whether you know that you have
13 these pending patent applications.

14 Q. So what you're saying is the violation here is we
15 told them we have patents, but we didn't write the
16 application number down?

17 A. The violation --

18 Q. Is that what your testimony is?

19 A. My testimony is that the standard in the
20 standards body's intellectual property policy is to make a
21 best effort to disclose known, pending applications and
22 patents. When there's knowledge, the forms provide a tool
23 to disclose specifically the patent applications that one
24 knows about. But that's not what happened.

25 Q. Okay. Well, let me ask you this: There's

1 hundreds of people that go to these meetings, right?

2 A. That's true.

3 Q. Thousands of contributions get submitted. Right?

4 A. There are many contributions, yes.

5 Q. Hundreds, thousands? Correct?

6 A. Okay.

7 Q. And the engineers discuss and debate them for
8 days in meetings, determining which contributions make it
9 into the standard. Correct?

10 A. That's a reasonable representation of the
11 process, yes.

12 Q. Do you have any evidence that anybody in one of
13 those meetings came up to Nokia and said, hey, we see you've
14 got a patent potentially here; can we get the application
15 number? Any evidence that ever happened?

16 A. I don't -- no, I wouldn't look for that type of
17 evidence. I don't have it.

18 Q. Is it even public at that point? Can you even
19 look up the patent?

20 A. It depends on the facts of the specific patent
21 application. So the timelines are relevant there, but could
22 be.

23 Q. And of these thousands of contributions, what
24 percentage do you think are actually covered by some patent
25 and there's a disclosure about patents in the contribution?

1 A. Sorry, you're asking what percentage of
2 contributions have essential patents?

3 Q. Have an essential patent disclosure on them.

4 A. I haven't tried to check what percentage of
5 disclosures have --

6 Q. You understand the experts in this case that have
7 been retained by HP and Amazon say that there are literally
8 hundreds of essential H.264 and 265 patent families in the
9 pools, don't you?

10 A. Yes.

11 Q. So -- and that would have emerged from work in
12 these working groups, would have emerged from contributions,
13 wouldn't they?

14 A. That depends.

15 Q. And you understand these meetings have very
16 lengthy, very detailed minutes for everything that's said in
17 the meeting, right?

18 A. Yes, I understand there are minutes.

19 Q. And you haven't come into court, have you, with
20 -- haven't gone and had access to all those meeting minutes
21 with anything where you can show that the engineers at these
22 meetings were actually discussing, debating, arguing about
23 whether to include patented or unpatented technology into
24 the standard, can you?

25 A. I've spoken to engineers who participate in

1 standards setting. And among other things, I listened to
2 the testimony of Dr. Kia. That makes me believe that they
3 are aware of the patent landscape and that different firms
4 may seek to assert patents that are -- become essential to a
5 standard and care about these things.

6 In general, they don't talk about it in the
7 meetings, in part because there are considerations, you
8 know, sort of -- it's often they have corporate attorneys
9 who inform them not to talk about patents and not to talk
10 about royalties in the meetings. That doesn't mean they
11 don't think about it and form expectations based on the
12 contents of these disclosures.

13 Q. Sir, that was non-responsive. My question was
14 very simple.

15 You haven't come into court with a single piece
16 of paper where you can show as proof here's where people are
17 talking about patented versus unpatented technologies, can
18 you?

19 A. I don't have any such piece of paper.

20 Q. Okay.

21 MR. STEVENSON: Pass the witness.

22 MR. BUI: No questions, Your Honor. Thank you.

23 JUDGE ELLIOT: Very well. Ms. Ascarrunz.

24 MS. ASCARRUNZ: Just a very brief redirect, Your
25 Honor.

1 REDIRECT EXAMINATION

2 BY MS. ASCARRUNZ:

3 Q. Dr. Simcoe, do you recall Mr. Stevenson asking
4 you about whether Nokia had to identify specific patents or
5 applications?

6 A. Yes.

7 Q. And has Nokia at times disclosed specific patents
8 and applications before the standards were adopted?

9 A. Yes.

10 Q. Did it do so for the patents-in-suit?

11 A. No.

12 MS. ASCARRUNZ: That's all I have, Your Honor.

13 JUDGE ELLIOT: Very well.

14 Dr. Simcoe, thank you very much.

15 THE WITNESS: Thank you.

16 (The witness stood down.)

17 MR. BADER: Amazon Respondents' next witness is
18 Dr. Mario Lopez.

19 Whereupon--

20 MARIO LOPEZ,

21 having been first duly sworn/affirmed, was examined and
22 testified as follows:

23 THE WITNESS: I do.

24 MR. BADER: Martin Bader on behalf of the Amazon
25 Respondents.

1 DIRECT EXAMINATION

2 BY MR. BADER:

3 Q. Dr. Lopez, can you please introduce yourself to
4 the Court.

5 A. Yes. My name is Mario Lopez. I am an economist
6 and vice president at Charles River Associates. That's an
7 economic and financial consultancy in the United States.

8 Q. Would you please describe your educational
9 background and work experience.

10 A. Yes. So I received a B.A. and a Ph.D. from the
11 University of California at Berkeley. I frequently consult
12 for both SEP holders and licensees in the issues of
13 determining FRAND royalty rates or other FRAND issues that
14 may arise, including the advising of offers.

15 I have worked in a variety of standards,
16 including some of those listed here and on my CV. And I've
17 published papers related to the determination of FRAND
18 royalties, including methodologies for doing so, as well as
19 welfare considerations that should be taken into account
20 when considering ITC exclusion orders.

21 MR. BADER: Your Honor, Amazon tenders Dr. Lopez
22 as an expert in economics and the valuation of RAND
23 royalties for standard essential patents.

24 JUDGE ELLIOT: Very well.

25 MR. BADER: And at this time, we're going to need

1 to go on the confidential record. We're going to be
2 discussing Nokia's licenses, so third-party confidential.

3 JUDGE ELLIOT: Very well.

4 (Whereupon, the hearing proceeded in confidential
5 session.)

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 BY MR. McCARTY:

3 Q. Dr. Lopez, I'm going to start out by asking you a
4 couple of questions about Nokia license agreements that you
5 were provided for your review in the course of this
6 investigation. And my questions are really straightforward
7 yes or no answers. So we shouldn't have to get into the
8 details of those licenses.

9 Let's start with Nokia's license agreement with
10 Lenovo. Yes or no, you did not unpack any H.264 or H.265
11 video rates from Nokia's license with Lenovo, correct?

12 A. That's a cellular license. No, I did not.

13 Q. Okay. The same is true for Nokia's licenses with
14 Microsoft, Huawei, and LG?

15 A. That is correct, specifically because Nokia has
16 23,000 5G families, and these are cellular-driven licenses,
17 yes.

18 Q. Okay. But just so the record is clear, you
19 didn't unpack any H.264 or H.265 video rates from the
20 Microsoft, Huawei, or LG agreements?

21 A. That is correct.

22 Q. Okay. And the same is true for Nokia's licenses
23 with Apple and Xiaomi?

24 A. That is correct.

25 Q. And the same is true for Nokia's license with

1 Samsung that includes cellular patents?

2 A. Its cellular license portfolio, that's correct,
3 yes.

4 Q. All right. Let's switch gears and I want you to
5 think back to your testimony in the courtroom in the 1379
6 investigation and specifically the slides you presented
7 during your direct. And we have one of those slides we can
8 pull up here.

9 Mr. Moreno, if you could pull up CDX-38C.2.

10 And on the left side is the slide you presented
11 during your testimony in the 1379 investigation, and on the
12 right side is your testimony in connection with that slide.

13 A. Okay.

14 Q. Are we on the same page? Okay.

15 And as we can see from your testimony in the 1379
16 investigation over here to the right, you testified that
17 around 2010 or maybe sometime afterwards the industry
18 becomes locked into the H.264 standard. That was your
19 testimony, correct?

20 A. Yes, that's there. Yes.

21 Q. Okay. And, in fact, if we look at your
22 demonstrative slide up here on the left from your direct
23 testimony in 1379, you actually put an orange line on the
24 chart here to delineate that lock-in point of 2010 or
25 afterwards that you testified to. Right?

1 A. Yes, that is correct.

2 Q. Okay. And the way you set up your chart here is
3 you were tracking the Codec share on the Y axis off to the
4 left. Right?

5 A. Yes, that's correct.

6 Q. Okay. So if we look at 2008, for example, the
7 H.264 Codec share at that time was around 35 percent?

8 A. Yeah, I'm extrapolating here, but yes, that's
9 what it's extrapolated to, yes.

10 Q. Okay. And, yes or no, the period prior to
11 lock-in in 2010 or afterwards that you presented on your
12 slide in the 1379 investigation, that's what you referred
13 to, the period prior to 2010, as the adoption period in your
14 testimony?

15 A. Yeah, it was the period when implementers were
16 considering whether or not to incorporate H.264 into their
17 products, yes.

18 Q. And the label you put on that period was the
19 adoption period? That was your terminology?

20 A. Yeah. That's when the major adoption was
21 happening, that's correct.

22 Q. Okay. Now, I want to turn and fast-forward now
23 to your expert report in this investigation. And you
24 offered the opinion that with regard to H.264, lock-in was
25 the result of H.264 being "adopted by a significant share of

1 the market." Do you recall that?

2 A. I don't recall that specifically, but that sounds
3 right.

4 Q. Okay. And in your initial expert report in this
5 investigation, which you submitted on May 31st of this year,
6 you offered your opinion that the H.265 standard competes
7 with several other Codecs that have similar performance in
8 terms of data compression and picture quality. That was the
9 opinion you offered, right?

10 A. I apologize. I'm not sure what time frame you're
11 referring to here. And I don't --

12 Q. Yeah. Let's pull up your report --

13 A. -- I don't recall it specifically.

14 Q. -- which we have in CDX-38C, and it's slide 4.

15 And you submitted this report on May 31st of this
16 year. Right?

17 A. That's correct.

18 Q. And in paragraph 26, what you wrote is the HEVC
19 standard competes with several other Codecs that have
20 similar performance in terms of data compression and picture
21 quality.

22 A. That is correct, yes.

23 Q. And two of the Codecs that compete with HEVC or
24 H.265 are the VP9 Codec -- which you specifically identified
25 here, right?

1 A. Yes.

2 Q. And you previously testified that the AV1 Codec
3 also competes with H.265, correct?

4 A. That is correct, yes.

5 Q. Now, you used a similar timeline and Codec share
6 graph during your direct earlier this afternoon. And it
7 might be helpful just to put up your slide from your 1379
8 testimony and your slide from earlier this afternoon on
9 Codec share side-by-side.

10 So we've got it here on a single slide. And --

11 MR. McCARTY: Oh, we need to go on the
12 confidential record. Apologies.

13 JUDGE ELLIOT: Very well.

14 MR. McCARTY: Nokia confidential. And then we'll
15 put the slide back up.

16 (Whereupon, the hearing proceeded in confidential
17 session.)

18

19

20

21

22

23

24

25

1 O P E N S E S S I O N

2 MR. HAWKINS: Good afternoon, Your Honor. Brent
3 Hawkins for HP.

4 JUDGE ELLIOT: Yes. So come on up, sir.

5 MR. HAWKINS: HP calls Mr. Brian Napper.
6 Whereupon--

7 BRIAN NAPPER,
8 having been first duly sworn/affirmed, was examined and
9 testified as follows:

10

11 THE WITNESS: I do. Thank you, Your Honor.

12 MR. HAWKINS: May I proceed?

13 JUDGE ELLIOT: Go ahead.

14 MR. HAWKINS: Thank you, Your Honor.

15 DIRECT EXAMINATION

16 BY MR. HAWKINS:

17 Q. Good afternoon, Mr. Napper. Could you please
18 introduce yourself TO the Court.

19 A. Yes. My name is Brian Napper. I'm a senior
20 managing director with an intellectual property consulting
21 firm, a national firm called Ocean Tomo. I am part of their
22 leadership team. I've been there two years. I have also
23 been in charge of the global intellectual property group at
24 Deloitte and FTI Consulting and also had small startup
25 companies, as well all in the area of intellectual property.

1 Q. Mr. Napper, do you have any particular experience
2 with SEP licensing and RAND principles?

3 A. I do. I have worked both outside of the context
4 of litigation advising standard essential patent holders as
5 to proffering a rate that would be consistent with RAND in a
6 number of different Codecs, as well as standards, cellular,
7 audio, video, and several others.

8 I have also testified on numerous occasions with
9 respect to the constructs of reasonable, non-discriminatory
10 as it relates to SEP rates.

11 Q. And were you previously qualified as an expert in
12 RAND licensing in the 1379 investigation?

13 A. I was.

14 MR. HAWKINS: Your Honor, at this time, HP
15 tenders Mr. Napper as an expert in RAND licensing?

16 JUDGE ELLIOT: Very well.

17 BY MR. HAWKINS:

18 Q. Mr. Napper, what was your assignment in this
19 case?

20 A. I was asked to do two analyses. The first
21 analysis is to look at what a reasonable RAND range would be
22 for Nokia's H.264/5 patent portfolio, and, secondly, to then
23 assess Nokia's 60 euro cent rate that they believe is
24 consistent with RAND principles and whether I agree with
25 that observation.

1 Q. Okay. Did you have a similar assignment in the
2 1379 investigation?

3 A. I did. That was focused on H.264 but, yes,
4 similar assignment.

5 MR. HAWKINS: Your Honor, I would like to request
6 that we proceed on the confidential record for Nokia CBI?

7 JUDGE ELLIOT: Very well.

8 (Whereupon, the hearing proceeded in confidential
9 session.)

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1 O P E N S E S S I O N

2 MR. STEVENSON: Very briefly on the public
3 record.

4 CROSS-EXAMINATION

5 BY MR. STEVENSON:

6 Q. Hello again, Mr. Napper.

7 A. Hello, Mr. Stevenson.

8 Q. You gave much of that presentation in 1390 and I
9 got to ask you questions in that case, so I am going to try
10 to keep it very short and not replot much old ground.

11 A. Did you say 1390?

12 Q. Did I say 1390? I meant 1379.

13 A. Close enough.

14 Q. I'm already showing my lack of math skills.

15 Now, fair to say in this case that you had access
16 to all of the licenses, whether running royalty or lump sum,
17 that were produced by Nokia in this case?

18 A. Yes.

19 Q. And you didn't unpack any of the lump sum
20 agreements either in your opening report or your rebuttal
21 expert report, did you?

22 A. I did not believe there was appropriate data to
23 do that, so I did not unpack those.

24 Q. Okay. Now, let me go through your slide 2. What
25 I am going to call my slide 2. This is your slide with the

1 RAND range. If I could have it, please, Mr. Moreno.

2 You just showed us this. I believe it is your
3 slide 29.

4 A. Yes. I am familiar with this slide.

5 Q. Okay. What I think you're trying to do here is
6 calculate the low end and the high end of the RAND range,
7 right?

8 A. That's correct.

9 Q. Low end is in your opinion 1.1 cents and the high
10 end is 8.2 cents per unit, right?

11 A. That's correct, combined for 264 and 265.

12 Q. And I know in your report you did a number of
13 alternative calculations basically doing a pool analysis
14 with the Robart multiplier methodology?

15 A. That's true.

16 Q. That's how you got to this range of numbers.

17 A. Yes. Well, the low end doesn't do the
18 multiplier. And the high end does.

19 Q. And in the 1379 case, you actually had another
20 methodology. You did another analysis that you didn't
21 include here that yielded 13 cents per unit. Correct?

22 A. In the 1379 case I believe I was doing what's
23 called a stack analysis, which I already commented upon. I
24 think we discussed this in the 1379. And it was as a result
25 of the stack analysis that was a 13 cent outcome.

1 Q. Right.

2 A. But not part of -- not part of establishing a
3 RAND range.

4 Q. You didn't put the 13 cents on your slide,
5 correct?

6 A. Right. Because that wasn't a calculation for a
7 RAND range because it was for stack. It was trying to
8 determine 13 cents and how that compares to the profit of
9 HP.

10 Q. And, in fact, you omitted that calculation
11 completely from your report in this 1380 investigation,
12 didn't you?

13 A. I do it for the reasons I just said. It was like
14 I did the stack a little bit differently for 1380. And I
15 didn't need to calculate that number anymore.

16 Q. Okay. And you understand we're going to talk
17 about these numbers. Obviously, my client, Nokia doesn't
18 believe any of these numbers are RAND rates. They think
19 they are too low. And that's the dispute between the
20 parties here, right?

21 A. I wouldn't be surprised if your client believes
22 those rates are too low.

23 MR. STEVENSON: Okay. We need to go on the
24 confidential record. This will be Nokia and HP confidential
25 information.

1 JUDGE ELLIOT: Very well.
2 (Whereupon, the hearing proceeded in confidential
3 session.)
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Heritage Reporting Corporation
(202) 628-4888

1 O P E N S E S S I O N

2 Whereupon--

3 ARTHUR LEVIN,
4 having been first duly sworn/affirmed, was examined and
5 testified as follows:

6

7 THE WITNESS: I do.

8 JUDGE ELLIOT: Have a seat.

9 MR. LIPSCHITZ: May I proceed, Your Honor?

10 JUDGE ELLIOT: Let's wait just a second until we
11 get everything oriented. We have an easel.

12 MR. LIPSCHITZ: We do, Your Honor.

13 JUDGE ELLIOT: I haven't had an easel in years.

14 MR. LIPSCHITZ: Glad to be the first.

15 JUDGE ELLIOT: All right, go ahead, Mr.
16 Lipschitz.

17 MR. LIPSCHITZ: Thank you, sir.

18 DIRECT EXAMINATION

19 BY MR. LIPSCHITZ:

20 Q. Good afternoon, Mr. Levin. Will you please state
21 your name for the record?

22 A. Good afternoon, Your Honor. My name is Arthur
23 Bennett Levin.

24 Q. Can you tell us where you spent most of your
25 career?

Heritage Reporting Corporation
(202) 628-4888

1 A. Most in the International Telecommunication
2 Union, the ITU in Geneva, Switzerland.

3 Q. How long did you work there?

4 A. More than 18 years.

5 Q. Can you tell us at a high level what your
6 responsibilities were at the ITU?

7 A. Yes, I was a senior advisor to the secretary
8 general. I was the organizer of all the major meetings of
9 the ITU including the plenipotentiary conference and the
10 council. I was a lead organizer of the World Summit on the
11 Information Society, which was a meeting attended by more
12 than 100 Presidents and Prime Ministers. I was the ITU
13 representative to the Chief Executive Board of the United
14 Nations.

15 And then my final position at the ITU I was chief
16 of operations and planning in the standard sector, where
17 among other things I advised on IP matters and supervised
18 the staff responsible for the patent declaration database.

19 Q. And were you personally involved in the
20 development of the ITU IPR policy at issue in this case?

21 A. Yes, I was. In 1998, the governing body of the
22 ITU designated a group of nine persons to finalize and
23 develop the ITU Patent Policy. And that was in 1998. In
24 1999 that policy was approved by the ITU members, which
25 include 193 countries and more than 200 companies that

1 participate in standards work under the designation of
2 sector members.

3 Q. What is the JVT and how did that relate to the
4 ITU?

5 A. The JVT is a technical group that developed the
6 H.264 recommendation. The ITU was one of its parent
7 organizations. And the JVT acted in compliance with the
8 ordinary policies and procedures of the ITU as well as the
9 ITU Patent Policy.

10 Q. And what is the JCT?

11 A. JCT is a technical group that was tasked to
12 develop H.265. And JCT also operated under -- one of its
13 parent bodies was the ITU. And it operated in compliance
14 with the ITU Patent Policy.

15 Q. Have you analyzed Nokia's submissions to these
16 organizations?

17 A. Yes, I have.

18 Q. And can you give us a preview of your conclusion,
19 your analysis?

20 A. My conclusion is that Nokia fully complied with
21 the disclosure obligations of the ITU, the JVT, and the JCT,
22 with respect to its asserted patents in this proceeding.

23 MR. LIPSCHITZ: Your Honor, Nokia offers Mr.
24 Levin as an expert on the relevant disclosure policies.

25 JUDGE ELLIOT: Very well.

1 BY MR. LIPSCHITZ:

2 Q. Okay, Mr. Levin. What are we looking at here on
3 CDX-13.4?

4 A. So this is the 2012 version of the ITU Patent
5 Policy. This is the version that was in effect at the time
6 of the adoption of H.265. There are several parts to this
7 policy. The first part is called the guidelines, are the
8 first eight pages. They are there to facilitate
9 implementation of the policy. The next -- the first annex
10 is the actual Patent Policy itself. And you can see that on
11 the right side of the screen.

12 And then there are a series -- the next annex is
13 the patent declaration form. Then there is the general
14 declaration form. So that is the Patent Policy. And if you
15 see that common Patent Policy refers to the fact that this
16 policy was a joint policy of ITU, ISO, and IEC, so three of
17 the largest standard setting organizations in the world.
18 The first common Patent Policy was from 2007.

19 Q. What led to the development of this ITU IPR
20 policy?

21 A. There was a lot of concern in the ITU in the late
22 1990s that there was a very rudimentary Patent Policy at
23 that time. Industry was changing. ITU was increasingly
24 being asked to address and develop standards that dealt with
25 technology, more patent implications. And so there was a

1 problem in 1996 where a recommendation was blocked and it
2 couldn't be resolved. So that led to the ITU wanting to
3 have a more formal Patent Policy, which is the one that we
4 adopted by the members in 1999.

5 Q. Okay. And you just mentioned a recommendation.
6 Is that the same thing as a standard in ITU parlance?

7 A. Yes. I will try and avoid ITU lingo, but in ITU,
8 a recommendation is the equivalent of a standard.

9 Q. And did you hear Dr. -- were you here for
10 Dr. Simcoe's testimony?

11 A. Yes, I was.

12 Q. Did you hear him say that engineers in these
13 meetings don't discuss patents?

14 A. Yes. That was one of the intents of the Patent
15 Policy adopted in 1999. There is a rather interesting
16 introduction on the first page of that policy. And among
17 other things, it indicated that patents would become more
18 important in ITU development work, that ITU did not want to
19 have patent matters discussed at the ITU, that if they did,
20 they would require lawyers to attend ITU technical meetings
21 instead of engineers, that it would impose additional staff
22 costs.

23 So the general philosophy throughout the policy
24 is that engineers are to be discussing technical matters and
25 not patent matters. There is language to that effect

1 throughout the policy.

2 Q. When you helped develop the policy, what was your
3 understanding as to the intent, objective of the policy?

4 A. I think that's highlighted, it is right there,
5 yes. So the sole objective of the policy, and this language
6 we're talking here, this is the 2012 policy, but it is the
7 same language from 1999. So it has stood the test of time.

8 The sole objective is that ITU recommendations or
9 standards be accessible to everybody without undue
10 constraints. And to achieve that, ITU wants to assure that
11 recommendations that it adopted were not encumbered by
12 patent holders who were refusing to license their rights on
13 either free or RAND terms. So they wanted to avoid a patent
14 blockage.

15 Q. Is there any additional evidence that the
16 objective of the engineers in the meetings is simply to pick
17 the best technology?

18 A. Yes, there is. And one of those is in the terms
19 of reference for the JVT itself where it talks about
20 developing the standard that would have the best possible
21 technical performance. I believe that's an exact quote.

22 Q. Can we please pull up CX-2416.0001.

23 If we could please zoom in on the relevant
24 paragraph here. Thank you.

25 Can you point us out, sir, where this language is

1 you're referring to?

2 A. Yes, I can. If we're in the fourth paragraph,
3 we're looking at the third line down. Offer the best
4 possible technical performance. And that was the objective
5 of the JVT.

6 Q. Okay. Now -- let's go back to the slides,
7 please.

8 Now, what does the policy require ITU members to
9 submit?

10 A. Well, when I discuss the policy, I will be very
11 careful about what are mandatory obligations and what are
12 non-mandatory obligations. So if you look at 3, it says
13 whatever the case applies -- and we will get to the three
14 different licensing choices -- the patent holder has to
15 provide a written statement and that written statement is
16 the patent statement and licensing declaration form.

17 So this is a mandatory requirement. You have to
18 provide the patent statement and licensing form.

19 Q. And did you hear Mr. Simcoe -- I'm sorry,
20 Dr. Simcoe discuss the language in the policy that says any
21 known patent or patent application should from the outset be
22 drawn to the attention of the ITU?

23 Did you hear Dr. Simcoe talk about that?

24 A. Yes, I heard that. That is in Section 1 of the
25 same page. It says should from the outset.

1 Q. Does that language create a timing requirement
2 for patent disclosures?

3 A. The timing requirement in the Patent Policy is a
4 flexible one. And you can see that from the use of the word
5 "should" which is not a mandatory obligation.

6 Q. Okay. What do we see here, sir?

7 A. Again, in my experience at the ITU, I have
8 participated in the drafting of many, many resolutions and
9 treaties. And very careful attention is paid to language,
10 whether something is mandatory or is not mandatory.

11 This is from H.265 itself. And this is a set of
12 definitions that appear in that standard or recommendation.
13 And you can see that "shall," which is a proxy for "have" is
14 a term used to express mandatory requirements; whereas
15 "should" is something that is not a mandatory requirement.
16 It is encouraged to be followed, but is not a mandatory
17 requirement. And that's from H.265 itself.

18 Q. Okay. What does this slide show, sir? What does
19 this show here, sir?

20 A. Excuse me.

21 Q. I just pulled the next document titled Patent
22 Disclosure From the Guidelines. Can you explain this?

23 A. Yes. This is also language about timing and,
24 again, showing the flexibility of timing of filing your
25 patent declaration forms. This language is from the 2012

1 but again it appeared in 1999 as well.

2 And it says -- it refers to disclosing that
3 information before or after the approval of the
4 recommendation.

5 Q. So is there -- I'm sorry. Go ahead.

6 A. It clearly shows that you could submit your form
7 before approval of the recommendation but you could also
8 submit it after the recommendation.

9 Q. Okay. Let's turn to the content of the patent
10 declaration form provided by the ITU. Now, explain to us
11 what we're seeing here.

12 A. So this is the declaration form that you would
13 file with respect to a specific recommendation. You file it
14 only for one recommendation. And you can see it is a very
15 standardized form, all companies would have to use the same
16 form. And you would identify that specific recommendation
17 at the bottom of the form and you would fill in the number
18 and the title.

19 While it is not shown on the screen, I would
20 point out as well that the last page of this form has to be
21 signed by an authorized official of the company submitting
22 the form.

23 Q. Are ITU members -- do they typically submit 1, 2
24 -- how many of these forms per standard?

25 A. All they have to submit really is one form per

1 standard. Sometimes they submit more but all they really
2 have to do is one form per standard.

3 Q. Can you please walk us through the three
4 licensing options on the form?

5 A. Yes. So this is the next page of the form. And
6 here you see three licensing options. The first one is to
7 license free of charge. The second one is to the license on
8 RAND terms. And then the third one is when you're unwilling
9 to grant a license, you have to provide the following
10 information. You must provide it to the ITU.

11 Q. So under which of these options is a company
12 required to specifically identify patents, to write patent
13 numbers on the form?

14 A. Yeah. So the only situation where that arises,
15 again, because of the specificity of the language is if
16 you're unwilling to grant a license, you must provide the
17 following information. And you can see there are three
18 indents there that specify what that information is and it
19 includes the patent number or the patent application number,
20 if pending, and additional information.

21 Q. And how long has this been the case that the form
22 has been this way?

23 A. These three choices and this type of language
24 between mandatory language and 3 being the only situation
25 where you have to provide specific patent information has

1 been in the form since 1999.

2 Q. So why did you all at the ITU only require
3 specific identification of patents in the event that option
4 3 was selected?

5 A. Well, this gets back to the sole objective of the
6 policy. If a company was refusing to grant a license, then
7 the ITU would want to have information about that patent and
8 about the individual patent. With that information, the ITU
9 could then see if that information or that part of the
10 recommendation could be removed or other steps could be
11 taken so that the recommendation was not encumbered.

12 On the other hand, if you're willing to license
13 free or on RAND terms, there was no problem with blocking
14 the patent, no need for that type of information.

15 Q. Okay. Now, did you at the ITU do anything else
16 to make crystal clear that specifically writing down the
17 patent numbers is only required if you select option 3?

18 A. Yes. We certainly tried as much as we could to
19 make it as clear as possible. So this is the next page.
20 And then you could see the top of this page it says patent
21 information, desired but not required for options 1 and 2.
22 So this means that if you're licensing for free or on RAND
23 terms, options 1 and 2, any additional patent information is
24 desired but it is not required. And, again, looking at the
25 language there, it is not mandatory language.

1 Q. Did you hear Dr. Simcoe say that Nokia was
2 required to specifically identify each and every patent
3 application and patent number on its forms that it submits
4 to the ITU?

5 A. I heard that. And it's simply not what the
6 policy provides. The policy says that you do not have to
7 indicate specific patent information unless you're refusing
8 to license. And as we will see in every case, Nokia was
9 absolutely willing to license on RAND terms.

10 Now, I will point out, though, that you could
11 choose to provide that information but it was not required.

12 Q. Okay. Is there any language in the guidelines
13 confirming that disclosure of specific patent information is
14 not required if you're willing to license on RAND terms?

15 A. Yes, there is more language. So this is Section
16 -- this is from the guidelines. This is clause 6. It
17 refers to the patent information database. And this same
18 language has been there under different section numbers
19 since 1999.

20 As I mentioned, all these patent declaration
21 forms go into a database. It is a public database. Anybody
22 can see that database. Any company, you don't have to be
23 involved with the JVT or the JCT to be able to see this
24 information.

25 And this section says that the patent information

1 database may contain information on specific patents or may
2 contain no such information but, rather, a statement about
3 compliance with the Patent Policy. So this, again, this
4 language also has been in the Patent Policy since 1999.
5 This is the 2012 version.

6 Q. Okay. Let's turn to Nokia's submissions to the
7 ITU. When did Nokia submit the general declaration shown
8 here on CDX-13.13?

9 A. So I first should explain a bit what a general
10 declaration is. So I talked a little bit about the specific
11 patent declaration, which is specific to one recommendation.
12 ITU also allows for the general declaration. This is a
13 declaration that would apply to any recommendation of the
14 ITU.

15 And this was submitted by Nokia in June of 2001.
16 And you can see on this form there is only two choices. And
17 Nokia selected 2. They were willing to grant on -- willing
18 to license on a -- RAND terms with respect to any ITU
19 recommendation.

20 Q. So as of 2001, had Nokia promised to the ITU that
21 it wouldn't block any of the ITU standards adopting a Nokia
22 contribution?

23 A. Yes, that's true.

24 Q. Okay. Now, how -- I'm sorry. What is the
25 declaration that we see here on CDX-13.14?

1 A. Okay. So now we are talking about specific
2 declarations or sometimes also called individual
3 declarations in the ITU. So this is the first specific
4 declaration that Nokia filed with respect to H.264. And
5 this was filed in -- you can see the date stamp of 30
6 October 2002.

7 So this applies only to H.264. And you can see
8 they checked box 2, they were willing to license on RAND
9 terms.

10 Q. And was Nokia's submission of this declaration
11 form sufficient to satisfy its disclosure obligations for
12 H.264?

13 A. Yes, it was, because this declaration and an
14 agreement to -- a statement to and commitment to license on
15 RAND terms applied to any Nokia patents or patent rights
16 they might assert with respect to H.264. So it was all
17 encompassing.

18 Q. Let's go to CDX-13.15.

19 What licensing option did Nokia select on its
20 form for H.265?

21 A. Well this is the same specific form with respect
22 to H.265. And here, again, this was filed in June of 2013
23 or submitted. And here again Nokia checked box 2,
24 indicating they would license on RAND terms with respect to
25 any of their patent rights under H.265.

1 Q. Was Nokia's submission of this form sufficient to
2 satisfy its disclosure obligations to the ITU for H.265?

3 A. Yes, it is, because any further disclosure of
4 individual patents was not required.

5 Q. Now, did Nokia go ahead anyway and specifically
6 disclose each of the patents asserted in this case?

7 A. Yes, they did. So here we're talking about
8 H.265. And you can see that in June 2013, on a declaration
9 that we just looked at, they did provide additional patent
10 information and they specifically identified the '321, '818,
11 and '714 patents.

12 They then went on to submit patent declarations
13 to identify '267 and '991. And in all of those cases, they
14 checked box 2.

15 Q. Okay. Was Nokia required to make these
16 additional disclosures?

17 A. No, they weren't. They were not. I mean --

18 Q. Okay. And next, sir, we have the two patents in
19 this case related or that are allegedly essential to H.264.
20 Did Nokia specifically identify these two patents on forms
21 as well?

22 A. Yes, they did. The '321 and the '818 patents are
23 being asserted against 264 and 265. In this case, this is
24 the declaration forms filed with respect to H.264 in which
25 Nokia chose voluntarily to specifically identify those two

1 patents, the '321 and '818.

2 And I would point out as we have just seen that
3 these declarations were filed after they had already filed a
4 declaration that applied to any patents with respect to
5 '264.

6 Q. Now, in light of the submissions you just walked
7 us through, what is your opinion with regard to whether
8 Nokia complied with the ITU Patent Policy?

9 A. In my view, Nokia fully complied with all of the
10 disclosure obligations under the ITU Patent Policy. And, in
11 addition, provided additional information that was not
12 required.

13 Q. All right. Let's turn to the JVT. What is the
14 JVT Patent Policy we're looking at here?

15 A. These are some excerpts from the JVT Patent
16 Policy. So JVT in its terms of reference also added its own
17 Patent Policy. And you can see that one of the requirements
18 of the JVT Patent Policy was that participants submitting a
19 technical contribution attach to that contribution a fully
20 filled-out JVT patent disclosure form. JVT decided to have
21 its own patent form.

22 That patent form was not a replacement for the
23 ITU patent form. And you can see that this patent form did
24 not have to be signed and it was for information only.

25 Q. Okay. The is the JVT Patent Policy relevant to

1 all five patents in this case?

2 A. No, it's not. The JVT Patent Policy is only
3 relevant to '818 and '134 -- sorry, '818 and -- I think I
4 forgot the number.

5 Q. Is it the H.264 patents?

6 A. Yeah, the H.264 patents.

7 Q. Okay. Is this the JVT patent disclosure form you
8 just mentioned?

9 A. Yes, it is.

10 Q. And what was the JVT's intent in creating this
11 form?

12 A. The intent? Well, the intent is that JVT experts
13 should know in advance of any patent issues.

14 Q. Under what circumstances is identifying specific
15 patents required on this form? Where is the mandatory
16 language?

17 A. Yes. So this is very similar to the ITU Patent
18 Policy. The mandatory language, and you see it under 2.3,
19 is the following information must be provided as part of
20 this declaration. And that was in an instance where the
21 patent holder was not willing to grant licenses. So in that
22 instance, you have to provide specific patent information.

23 Q. Is it required if you are willing to license on
24 RAND terms?

25 A. No, it's not.

1 Q. Okay. What is this document we see on CDX-13.20?

2 A. So this is one of the Nokia contributions to the
3 JVT. And this one was in January of 2002. This relates to
4 the '321 contribution.

5 Q. This is Nokia's technical contribution; is that
6 correct, sir?

7 A. Yes, it is.

8 Q. And did Nokia attach a fully filled-out JVT
9 disclosure form to this contribution?

10 A. Yes. On this form, they checked box 2.2.1,
11 indicating their willingness to license on RAND terms.

12 Q. Okay. Now, sir, I see here that the lines on the
13 right where the patent number and the inventor assignee
14 name, et cetera, those aren't filled out. Can you explain
15 that to us?

16 A. Yes, I can. This part of the form was for
17 companies that were willing to license on RAND terms. And
18 they had the option of providing additional information
19 about their patents, very similar to the ITU Patent Policy.
20 But this information was not required. So a fully
21 filled-out form did not require this information. It was an
22 option, given to JVT participants.

23 Q. Okay, sir. What is this contribution that we see
24 here on CDX-13.21?

25 A. This is another JVT contribution -- Nokia

1 contribution to the JVT in May, actually a meeting took
2 place in Fairfax, Virginia. And this relates to the '818
3 patent.

4 Q. Did Nokia attach a fully filled-out form to this
5 proposal?

6 A. Yes, they did.

7 Q. And what did Nokia select?

8 A. Nokia selected Box 2.0. This is that the
9 submitter is not aware of having any granted, pending, or
10 planned patents.

11 Q. Had Nokia filed the '818 patent application when
12 it submitted this contribution to the JVT?

13 A. Could you repeat your question.

14 Q. Had Nokia already filed the '818 patent
15 application when it submitted that form to the JVT?

16 A. No, they had not. This was submitted to the JVT
17 in early May of 2002. They did not file their patent
18 application until one year later in April of 2003.

19 Q. Okay. So can you please put this in context for
20 us with what we see here on CDX-13.22?

21 A. Yes. So in terms of Nokia's participation in JVT
22 as of 2001, they had made a general declaration indicating
23 their willingness to license on RAND terms with respect to
24 any recommendation. Then they submitted their JVT
25 contribution related to '818 in May.

1 In October, they submitted their first specific
2 declaration with respect to 264. That declaration, as I
3 mentioned, was a willingness to license on RAND terms with
4 respect to any of their patent rights that might be
5 essential to H.264.

6 And that declaration was submitted even before
7 JVT had agreed on a text, which occurred in December of
8 2002. All of this took place even before Nokia applied for
9 the '818 patent, which took place in the end of 2003.

10 So in terms of whether a patent issue could
11 arise, and the concern of the JVT about patent issues
12 arising or refusals to license, Nokia was on public record
13 that from 2001 on, it would license on RAND terms.

14 Q. Okay. When did the '818 patent issue?

15 A. It issued in May 25 of 2010.

16 Q. When did Nokia specifically identify it on an
17 additional RAND declaration?

18 A. I'm sorry, it is a letters noisy back here.

19 Q. When did Nokia specifically identify it on an
20 additional RAND declaration?

21 A. Yes, they did. So Nokia identified '818 in 2010
22 in the patent declaration form with respect to H.264. It
23 later on identified it with respect to the H.265.

24 Q. All right. Let's turn to the JCT Patent Policy
25 now. Did the JCT create its own disclosure form like the

1 JVT did?

2 A. Well, the JCT terms of reference -- we're now in
3 2010 and they took a different approach. The JCT did not
4 create its own form. Instead, they simply said that if you
5 submit a contribution, if you submit a contribution, you
6 shall -- it shall contain a non-binding, informal notice of
7 whether you have patent rights and you're licensing category
8 for those rights.

9 And I would point out as well, this -- even the
10 JCT policy was supplemental to and did not replace the
11 obligation to submit a formal patent declaration form to the
12 ITU.

13 Q. Okay. Did Nokia submit any contributions to the
14 JCT that relate to the asserted patents?

15 A. Yes, they did. They submitted two contributions
16 to start. These were related to the '267 patent, which is
17 the one on the left. The one related to the '714 patent is
18 the one on the right. And both of these contributions were
19 made in 2011.

20 Q. Okay. So with respect to the '267 patent
21 contribution, the technical contribution that Nokia made to
22 the standard setting body, what statement did Nokia include
23 on that contribution?

24 A. They stated clearly in both instances that they
25 may have IPR relating to the technology and they would grant

1 licenses under RAND, i.e., reasonable and non-discriminatory
2 terms.

3 Q. Okay. So did Nokia provide a similar statement
4 with respect to the '714 patent?

5 A. Yes. You can see both of the statements lined up
6 there on the left and right. They are essentially the same.

7 Q. Did Nokia also submit a contribution to the JCT
8 for the '991 patent?

9 A. No, it did not.

10 Q. Did the JCT policy require Nokia to provide any
11 type of patent notice for the '991 patent?

12 A. No, it did not. You only had to provide this
13 notice about IPR if you were submitting the contribution.
14 So it did not apply if you were not submitting the
15 contribution, but I would point out that at the time that
16 these contributions were submitted, Nokia had already in its
17 general declaration indicated its willingness to license on
18 RAND terms with respect to any patent rights it might have
19 under H.265.

20 Q. Have you seen any indication that Nokia concealed
21 any of its patents from the JCT?

22 A. No, it did not. Clearly the two contributions
23 here relate to '267 and '714. And there was no attempt to
24 conceal its '991 patent.

25 Q. Okay. So what is your opinion with regard to

1 whether Nokia complied with the JCT policy?

2 A. In my view, Nokia fully complied with the JCT
3 Patent Policy.

4 Q. Okay. Let's get to the final topic, industry
5 practice. Now, as part of your analysis, did you review
6 every single patent declaration that was submitted to the
7 ITU for H.264 and H.265?

8 A. Yes, I did. And this is the board that
9 represents the summary of all those patent declarations.

10 Q. This is every one of them; is that right?

11 A. Yes. That's all 79. This, again, is a little
12 hard to read from this distance but it is the H.265
13 standard.

14 Q. What are the colors we see here?

15 A. So the colors are as follows. The orange are all
16 of the Nokia patent a declaration forms that were submitted.
17 And you can see that every one of them identifies specific
18 patents. Blue are other patent declaration forms from other
19 companies. And those are declarations that also identified
20 specific patent information.

21 White are companies that submitted patent
22 declarations but did not identify any specific patents. And
23 there is 37 of those. And then the gray is the date of the
24 approval of the standard H.265 by the study group, study
25 group 16.

1 Q. So what did this show you about the industry
2 practice?

3 A. This board, I think, very clearly shows you how
4 standards development actually occurred at ITU under the
5 Patent Policy, what was the timing, what was the type of
6 information provided. So a couple of things in my mind
7 stand out.

8 Only 14 patent declarations were submitted prior
9 to approval of the standard. And only one of those
10 identified any specific patent information. That's Number
11 8, Thompson. So there were 14 declaration forms before
12 approval; 65 after approval. So the vast majority of patent
13 declaration forms were submitted after the approval of the
14 recommendation.

15 With respect to Nokia, Nokia filed 21 patent
16 declaration forms. There is a total of 79. So Nokia
17 submitted more than 25 percent of all the patent declaration
18 forms under 265.

19 And then, finally, I calculated the total number
20 of patent numbers and patent applications on all of these
21 forms. And if you look at that, Nokia submitted 52 percent
22 of all the patent numbers and patent applications in H.265.

23 Q. Thank you, sir. And for the record, this board
24 is CDX -13.26.

25 Did you also make a similar board for H.264?

1 A. Yes, I did.

2 Q. And what did this one show us about the industry
3 practice, sir?

4 A. Without going into all the details, this board
5 shows a very similar pattern. There were 39 patent
6 declaration forms filed before approval, and 89 filed after
7 approval. So again, the majority of the patent declaration
8 forms are submitted after approval. Nokia submitted the
9 most patent declarations of any of the participants in 264.
10 I believe the total number is 36.

11 You can also see that Nokia in position 13 was
12 the very first company to file a patent declaration that
13 identifies specific patents in 264. And, again, doing the
14 analysis of adding up all of the patent numbers and patent
15 applications, Nokia supplied 68 percent of that information
16 to the work on 264.

17 Q. Sir, what is your ultimate conclusion that you
18 reached in this case?

19 A. My conclusion is Nokia fully complied with the
20 patent policies and the disclosure obligations of the ITU,
21 the JCT, and the JVT. And, in addition, it went beyond
22 those policies by providing more information about their
23 patents than any other company that participated in the work
24 under 264 or 265.

25 Q. Okay. Thank you, sir. I'm sorry, I failed to

1 mention for the record the H.264 board is at CDX-13.27.

2 MR. LIPSCHITZ: No further questions. Thank you,
3 Your Honor.

4 JUDGE ELLIOT: Mr. Rizzolo, how long do you think
5 it will be?

6 MR. RIZZOLO: About 20 minutes, Your Honor.

7 JUDGE ELLIOT: Oh, all right. Let's get started
8 and then we will break at 4:45.

9 MR. RIZZOLO: Your Honor, may I proceed?

10 JUDGE ELLIOT: Yes.

11 CROSS-EXAMINATION

12 BY MR. RIZZOLO:

13 Q. Good afternoon, Mr. Levin.

14 A. Good afternoon, counsel.

15 Q. Don't want to mess that name up again.

16 A. Yes, we spent a lot of time together.

17 Q. So counsel referred to you at the ITU during the
18 examination a number of times but you're not here speaking
19 on behalf of the ITU, correct?

20 A. I am speaking as an expert retained by Nokia.

21 Q. This is your personal opinion?

22 A. This is my opinion based on my experience at the
23 ITU.

24 Q. And you're being compensated by Nokia here?

25 A. Sorry. I always ask this, can you speak a little

1 louder?

2 Q. Sure. You're being compensated by Nokia here,
3 correct?

4 A. Yes, that's correct.

5 Q. And in your view, any disclosure of patents under
6 the ITU policy is completely voluntary and not required,
7 correct?

8 A. My statement is that disclosure of individual
9 patent information, specific patent information is not
10 required unless the company is refusing to license. If
11 you're refusing to license, then you have to provide that
12 information.

13 Q. To prepare your opinion in this case, you didn't
14 speak with anyone at the ITU, the JVT, or the JCT-VC,
15 correct?

16 A. I think that's correct. I mean, I certainly
17 talked about these matters when I was at the ITU but not in
18 terms of preparing this report.

19 Q. Okay. The ITU Patent Policy states that
20 participants should from the outset disclose the identity of
21 any known patent or pending patent application. True?

22 A. That is the language, yes.

23 Q. And you had a slide that said that "should" is
24 not a mandatory requirement in the ITU. Do you recall that?

25 A. Yes.

1 Q. But that document you pointed out, that's the
2 H.265 standard, not the Patent Policy, right?

3 A. No, that's the Patent -- that's the Patent
4 Policy. That's in the guidelines. If that's what your -- I
5 am not sure what your reference was to.

6 Q. I am happy to -- can we bring up CDX-13.7.
7 Do you recall this slide?

8 A. This slide, yes, that is a definition from H.265.

9 Q. Right. This doesn't say that the definition of
10 "should" here applies for all ITU purposes, does it?

11 A. No.

12 Q. Okay. So back to the ITU Patent Policy itself.
13 The disclosure language that I just discussed, that's
14 mandated by the Patent Policy; isn't that right?

15 A. Are you referring to the "from the outset"
16 language?

17 Q. Yes.

18 A. Well, it isn't the policy, but my view is that
19 that is not mandatory language. And my view is based on 18
20 years at the ITU. I participated in the drafting of many
21 resolutions and decisions and this policy as well. And in
22 the ITU, it is well understood that should is not a
23 mandatory requirement.

24 Q. But the guidelines for the Patent Policy say that
25 that disclosure language is mandated by the Patent Policy.

1 Isn't that right?

2 A. You would have to show me that language.

3 Q. I am happy to. Could we bring up JX-701 at page
4 8. This is the 2012 version of the guidelines. You
5 excerpted some of this in your slides. Do you recall that?

6 A. Yes.

7 Q. And actually you had -- sorry. I may have the
8 wrong page. Could we go to Section 3 down at the bottom.
9 Patent disclosure.

10 And do you see right under where it says patent
11 disclosure, it says "as mandated by the Patent Policy in its
12 paragraph 1"?

13 A. Yes, I see that.

14 Q. Okay. So that's mandatory language, right?

15 A. That's mandated but the actual language is
16 "should" which -- "should." Again, in my view "should" is
17 clearly not mandatory language and, in fact, if you look at
18 this, the next paragraph it says "from the outset." Then it
19 is says: "This might not be possible when the first draft
20 text appears."

21 And if you look at the 1999 policy, which was in
22 effect when JVT was working, the next section goes on to say
23 well, at least try -- you don't have to, but at least try
24 and make this patent disclosure before approval of the
25 standard. So it was a very flexible time arrangement for

1 making these disclosures, and in my view, there is no
2 absolute maximum deadline to make these disclosures.

3 I can only state that my experience in the ITU,
4 and I sat there in plenipotentiary conferences on the
5 podium, 2:00 o'clock in the morning arguing for an hour
6 whether to use "should" or "shall" in a resolution.

7 Q. Do you see here in the bottom of the second
8 paragraph, it says that the information should be provided
9 in good faith and on a best effort basis?

10 Do you see that?

11 A. Yes. That refers to when you decide to identify
12 a specific patent, yes. I see that, sure.

13 Q. Okay. And you didn't mention best efforts in
14 your examination, right? I didn't hear those words come out
15 of your mouth?

16 A. You're talking about my testimony right now?

17 Q. Your testimony today.

18 A. I didn't think I used that term, no.

19 Q. In fact, you didn't show this part of the
20 guidelines on your demonstrative slides, correct?

21 A. I don't think we did. And you didn't underline
22 -- there is no requirement for patent searches.

23 Q. That's happy. I am happy to highlight that too.

24 But according to these guidelines, the
25 information should be disclosed as early as possible during

1 the development of the ITU standard, right?

2 A. That's the language, but in my view, it's not
3 mandatory.

4 Q. I want to turn to your opinions about Nokia's
5 compliance with the patent policies?

6 JUDGE ELLIOT: Mr. Rizzolo, tell me when a good
7 time to break is.

8 MR. RIZZOLO: We could break now. I am shifting
9 gears a little bit so if you want to break.

10 JUDGE ELLIOT: Very good. So we will break for
11 the day. Mr. Swain.

12 MR. SWAIN: I am being told to sit down, Your
13 Honor. Nothing.

14 JUDGE ELLIOT: Mr. Levin, during our break,
15 please don't discuss your testimony with anyone. You can
16 talk about other things over night but just not your
17 testimony.

18 THE WITNESS: Yes, Your Honor.

19 JUDGE ELLIOT: As usual, if anything comes up
20 overnight, let me know in the morning. See you tomorrow.

21 (Whereupon, at 4:46 p.m., the hearing recessed,
22 to reconvene at 9:00 a.m. on Friday, September 13, 2024.)
23
24
25

1 C O N T E N T S

2

3	WITNESS	DIRECT	CROSS	REDIRECT	RE CROSS	STAFF
4	DAN SCHONFELD	1320	1360	1394		
5	NISHA MODY	1396	1411			
6	TIMOTHY SIMCOE	1427	1464	1485		
7	MARIO LOPEZ	1486	1509	1517		
8	BRIAN NAPPER	1520	1545	1555		
9	ARTHUR LEVIN	1559	1584			

10

11 AFTERNOON SESSION: 1463

12

13 CONFIDENTIAL SESSIONS

14	1321 - 1326
15	1354 - 1359
16	1369 - 1372
17	1464 - 1470
18	1488 - 1509
19	1515 - 1519
20	1523 - 1544
21	1549 - 1558

22

23

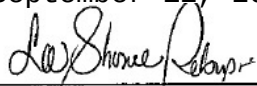
24

25

1 CERTIFICATE OF REPORTER
 2 TITLE: Certain Video Capable Electronic Devices
 3 INVESTIGATION NO: 337-TA-1380
 4 HEARING DATE: September 12, 2024
 5 LOCATION: Courtroom A
 6 NATURE OF HEARING: Evidentiary Hearing

7 I hereby certify that the foregoing/attached
 8 transcript is a true, correct and complete record of the
 9 above-referenced proceedings of the U.S. International
 Trade Commission.

9 Date: September 12, 2024

10 SIGNED: 

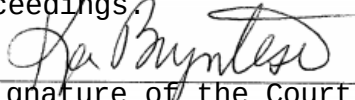
11 Signature of the Contractor of the
 12 Authorized Contractor's Representative
 1220 L Street, N.W., Suite 206
 Washington, D.C. 20005

13 I hereby certify that I am not the Court Reporter
 14 and that I have proofread the above-referenced transcript
 15 of the proceedings of the U.S. International Trade
 Commission, against the aforementioned Court Reporter's
 16 notes and recordings, for accuracy in transcription in the
 spelling, hyphenation, punctuation and speaker
 identification and did not make any changes of a
 17 substantive nature. The foregoing/attached transcript is a
 true, correct and complete transcription of the
 18 proceedings.

19 SIGNED: 

Signature of Proofreader

20 I hereby certify that I reported the above-referenced
 21 proceedings of the U.S. International Trade Commission and
 caused to be prepared from my tapes and notes of the
 22 proceedings a true, correct and complete verbatim recording
 of the proceedings.

23 SIGNED: 

24 Signature of the Court Reporter

25

Heritage Reporting Corporation
 (202) 628-4888

UNITED STATES INTERNATIONAL TRADE COMMISSION

In the Matter of:	)	Investigation No.
CERTAIN VIDEO CAPABLE ELECTRONIC	)	337-TA-1380
DEVICES, INCLUDING COMPUTERS,	)	
STREAMING DEVICES, TELEVISIONS,	)	
AND COMPONENTS AND	)	
MODULES THEREOF	)	

OPEN SESSIONS

Pages: 1592 through 1761 (with excerpts)
Place: Washington, D.C.
Date: September 13, 2024

HERITAGE REPORTING CORPORATION

Official Reporters
1220 L Street, N.W., Suite 206
Washington, D.C. 20005
(202) 628-4888
contracts@hrccourtreporters.com

1 UNITED STATES INTERNATIONAL TRADE COMMISSION
2 Washington, D.C.
3 BEFORE THE HONORABLE CAMERON R. ELLIOT
4 Administrative Law Judge
5 _____

6 In the Matter of:) Investigation No.
7 CERTAIN VIDEO CAPABLE ELECTRONIC) 337-TA-1380
8 DEVICES, INCLUDING COMPUTERS,)
9 STREAMING DEVICES, TELEVISIONS,)
10 AND COMPONENTS AND)
11 MODULES THEREOF)
12 _____

13
14 International Trade Commission
15 500 E Street, S.W.
16 Washington, D.C.
17

18 Friday, September 13, 2024
19

20 EVIDENTIARY HEARING - VOLUME V
21

22 The Hearing commenced in Courtroom A, pursuant to the
23 notice of the Judge, at 9:00 a.m. Eastern.
24

25 Reported by: Karen Brynteson, FAPR, RMR, CRR

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES:

2

3 For Complainants Nokia Technologies Oy and Nokia
4 Corporation:

5 ADAM D. SWAIN, ESQ.

6 Alston & Bird LLP

7 950 F Street, N.W.

8 Washington, D.C. 20004

9

10 JOHN D. HAYNES, ESQ.

11 NICHOLAS T. TSUI, ESQ.

12 MARK A. McCARTY, ESQ.

13 DAVID S. FRIST, ESQ.

14 Alston & Bird LLP

15 1201 West Peachtree Street

16 Atlanta, GA 30309

17

18 THEODORE STEVENSON, ESQ.

19 Alston & Bird LLP

20 2200 Ross Avenue, Suite 2300

21 Dallas, TX 75201

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 For Complainants Nokia Technologies Oy and Nokia
3 Corporation:

4 JENNIFER D. CIELUCH, ESQ.

5 Alston & Bird LLP

6 90 Park Avenue

7 New York, New York 10016

8

9 WARREN LIPSCHITZ, ESQ.

10 SAM MOORE, ESQ.

11 ERIK B. FOUNTAIN, ESQ.

12 McKool Smith PC

13 300 Crescent Court, Suite 1200

14 Dallas, TX 75201

15

16 R. MITCH VERBONCOEUR, ESQ.

17 JOSHUA J. NEWCOMER, ESQ.

18 McKool Smith PC

19 303 Colorado Street, Suite 2100

20 Austin, TX 78701

21

22 LAUREN SIMENAUER, ESQ.

23 McKool Smith

24 1999 K Street, N.W., Suite 600

25 Washington, DC 20006

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent Amazon.com, Inc. and
3 Amazon.com Services LLC:

4 THOMAS N. MILLIKAN, ESQ.

5 KYLE CANAVERA, ESQ.

6 Perkins Coie LLP

7 11452 El Camino Real, Suite 300

8 San Diego, CA 92130

9

10 VERONICA S. ASCARRUNZ, ESQ.

11 EMILY RICH, ESQ.

12 Perkins Coie LLP

13 700 13th Street, N.W., Suite 800

14 Washington, D.C. 20005

15

16 STEFANI E. SHANBERG, ESQ.

17 ROBIN L. BREWER, ESQ.

18 KARL JOHNSTON, ESQ.

19 Perkins Coie LLP

20 505 Howard Street, Suite 1000

21 San Francisco, CA 94105

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent Amazon.com, Inc. and
3 Amazon.com Services LLC:

4 ANDREW KLEIN, ESQ.

5 Perkins Coie LLP

6 3150 Porter Drive

7 Palo Alto, CA 94304

8

9

10 MARTIN R. BADER, ESQ.

11 RYAN CUNNINGHAM, ESQ.

12 Sheppard, Mullin, Richter & Hampton LLP

13 12275 El Camino Real, Suite 100

14 San Diego, CA 92130

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 STEPHANIE L. ROBERTS, ESQ.

4 Morgan, Lewis & Bockius, LLP

5 1111 Pennsylvania Avenue, N.W.

6 Washington, D.C. 20004

7

8 JASON E. GETTLEMAN, ESQ.

9 COREY R. HOUMAND, ESQ.

10 Morgan, Lewis & Bockius, LLP

11 1400 Page Mill Road

12 Palo Alto, CA 94304

13

14 DAVID J. LEVY, ESQ.

15 RICK L. RAMBO, ESQ.

16 THOMAS R. DAVIS, ESQ.

17 Morgan, Lewis & Bockius, LLP

18 1000 Louisiana Street, Suite 4000

19 Houston, TX 77002

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 BRENT A. HAWKINS, ESQ.

4 Morgan, Lewis & Bockus, LLP

5 One Market Spear Street Tower, 28th Floor

6 San Francisco, CA 94015

7

8 ZACHARY D. MILLER, ESQ.

9 Morgan, Lewis & Bockus, LLP

10 110 North Wacker Drive

11 Chicago, IL 60606

12

13 MATTHEW J. RIZZOLO, ESQ.

14 RYAN BRUNNER, ESQ.

15 Ropes & Gray LLP

16 2099 Pennsylvania Avenue, N.W.

17 Washington, D.C. 20006

18

19 KEVIN J. POST, ESQ.

20 LANCE W. SHAPIRO, ESQ.

21 Ropes & Gray LLP

22 1211 Avenue of the Americas

23 New York, New York 10036

24

25

Heritage Reporting Corporation
(202) 628-4888

1 APPEARANCES (Continued):

2 On behalf of Respondent HP Inc.:

3 SHONG YIN, ESQ.

4 Ropes & Gray LLP

5 1900 University Avenue, 6th Floor

6 East Palo Alto, CA 94303

7

8 For the Office of Unfair Import Investigations:

9 MARISSA DUCCA, ESQ.

10 JEFFREY HSU, ESQ.

11 U.S. International Trade Commission

12 500 E Street, S.W.

13 Washington, D.C. 20436

14

15

16

17

18

19

20

21

22

23

24

25

Heritage Reporting Corporation
(202) 628-4888

1 P R O C E E D I N G S

2 (9:00 a.m.)

3 JUDGE ELLIOT: Good morning. Have a seat.

4 We're here in the matter of Certain Video Capable
5 Electronic Devices, Including Computers, Streaming Devices,
6 Televisions, and Components and Modules Thereof, United
7 States International Trade Commission Investigation No.
8 337-TA-1380.

9 My name is Cameron Elliot, Presiding
10 Administrative Law Judge. May I have appearances from
11 counsel, please.

12 MR. SWAIN: Good morning, Your Honor. Adam Swain
13 from Alston & Bird on behalf of the Complainants, Nokia, as
14 well joined with McKool Smith.

15 JUDGE ELLIOT: Good morning.

16 MR. RIZZOLO: Good morning, Your Honor. Matt
17 Rizzolo on behalf of Respondent HP, and joining me is the
18 crew that we've had here all week.

19 MR. ZECK: Good morning, Your Honor. Kevin Zeck
20 on behalf of Perkins Coie representing Respondent Amazon,
21 Respondents Amazon. Additionally, the same contingent of
22 lawyers from Perkins Coie. Thank you.

23 MS. DUCCA: Good morning, Your Honor. Marissa
24 Ducca on behalf of OUII, and with me today is David Lloyd.

25 JUDGE ELLIOT: Good morning.

Heritage Reporting Corporation
(202) 628-4888

1 All right. Yes, Mr. Swain.

2 MR. SWAIN: Yes, Your Honor. I just want to give
3 you an update on time. I believe Complainants have spent 11
4 hours 27 minutes; Respondents 11 hours, 49 minutes. And
5 today we're going to complete Respondents' rebuttal and
6 case-in-chief -- I'm sorry.

7 We have completed Respondents' case-in-chief.
8 We're going on to Complainants' rebuttal case and we're
9 continue on with Mr. Levin and then go on to Drs. Moulin,
10 Orchard, and Kia.

11 We expect to be done right some time either right
12 before or right after lunch. We'll have some post-hearing
13 issues to bring up with you as far as admission of
14 demonstratives and a couple of stray exhibits that might
15 have inadvertently got left off. So we would leave it up to
16 Your Honor as to when you would like to address those. We
17 think it makes the most sense after all the evidence has
18 been entered in during the course of the hearing today to do
19 that.

20 JUDGE ELLIOT: All right. We'll leave that until
21 the end.

22 MR. SWAIN: Okay. Thank you, Your Honor.

23 JUDGE ELLIOT: Anything from Respondents?

24 MR. RIZZOLO: No, Your Honor.

25 JUDGE ELLIOT: Very good.

1 MS. DUCCA: Nothing from Staff, Your Honor.

2 JUDGE ELLIOT: All right. Give me just a moment.

3 All right. Mr. Levin, come on up.

4 Good morning, sir. Let me remind you, sir,
5 you're still under oath.

6 THE WITNESS: Yes, Your Honor. And good morning.
7 Whereupon--

8 ARTHUR LEVIN,
9 having been first duly sworn/affirmed, was examined and
10 testified as follows:

11 MR. RIZZOLO: May I proceed, Your Honor?

12 JUDGE ELLIOT: Yes.

13 CROSS-EXAMINATION

14 BY MR. RIZZOLO:

15 Q. Good morning, Mr. Levin.

16 A. Good morning, counsel.

17 Q. When we broke yesterday, I was just turning to
18 your opinions concerning Nokia's compliance with the Patent
19 Policies at issue here. Now, you didn't speak with anyone
20 at Nokia to inform your opinions, did you?

21 A. No, I did not speak with any -- there's an echo
22 here. I did not speak with anybody in Nokia -- in preparing
23 my report or in my depositions for my testimony.

24 Q. And you're not privy to what knowledge Nokia had
25 at any particular time, correct?

1 A. Well, that's a very general question.

2 Q. You stated in your deposition you didn't know
3 what knowledge Nokia had at any particular time, didn't you?

4 A. With respect to this proceeding, yes.

5 Q. Beyond reviewing the publicly available
6 disclosures that you talked about on direct, you don't know
7 what Nokia chose to disclose to the ITU at any particular
8 time, correct?

9 A. No, that's not correct.

10 Q. Okay. Well, why don't we bring up your
11 deposition at -- and this is from the 1380 investigation --
12 at page 100, lines 17 through 19. And we can highlight
13 lines 17 to 19.

14 You said: "I don't know what knowledge Nokia had
15 at any particular time. I'm not giving answers based on
16 what Nokia chose to disclose at what time because I'm not
17 privy to that information."

18 Do you see that?

19 A. Yes.

20 Q. Was that your testimony?

21 A. That's what I stated in deposition.

22 Q. Okay. And you don't have any knowledge regarding
23 Nokia's corporate or strategic decision-making process
24 regarding patent disclosure, do you?

25 A. Well, I was referring to what Nokia would

1 disclose at a particular time, but I'm aware of all of the
2 forms that Nokia has submitted to the ITU.

3 Q. And you have no insight into why Nokia made any
4 particular patent disclosures; isn't that right?

5 A. Could you repeat your question? Again, could you
6 speak a little louder, please.

7 Q. Sure. You have no insight into why Nokia chose
8 to disclose any patents at any particular time, correct?

9 A. Yes.

10 Q. You have no insight into the decisions made by
11 Nokia regarding what information it decided to provide to
12 the ITU; isn't that right?

13 A. With respect to Nokia, yes. With respect to
14 what's required by the ITU, I do have knowledge, of course.

15 MR. RIZZOLO: At this time, Your Honor, we have
16 to go on the Nokia confidential record.

17 JUDGE ELLIOT: Very well.

18 (Whereupon, the hearing proceeded in confidential
19 session.)
20
21
22
23
24
25

1 O P E N S E S S I O N

2 BY MR. RIZZOLO:

3 Q. So now I want to turn to your disclosure opinions
4 regarding the Patent Policy. So Nokia never identified any
5 of the five asserted patents here to the JVT, correct?

6 A. Well, the JVT only involved two of the patents --

7 Q. But Nokia never identified --

8 A. '321 and '818.

9 JUDGE ELLIOT: Stop, stop. This time I think
10 it's you, Mr. Rizzolo. So --

11 MR. RIZZOLO: I apologize.

12 JUDGE ELLIOT: -- you need to pause and make sure
13 you're not talking over Mr. Levin. Ask your question again.

14 MR. RIZZOLO: Sure.

15 BY MR. RIZZOLO:

16 Q. Nokia never specifically identified any of the
17 five asserted patents here to the JVT, did they?

18 A. In terms of specifically identifying a patent,
19 giving a patent number, no.

20 Q. And they never specifically identified any of the
21 patents here to the JCT either, did they?

22 A. They weren't required to do so.

23 Q. Okay. And they didn't identify any of the
24 patents here specifically to the ITU prior to the approval
25 of the H.265 standard, correct?

Heritage Reporting Corporation
(202) 628-4888

1 A. Could you state your question again, please?

2 Q. Sure. They never specifically identified any of
3 the asserted patents here to the ITU prior to approval of
4 the H.265 standard, correct?

5 A. Correct in the sense they did not list specific
6 patent numbers prior to approval.

7 Q. Okay. And you understand that Nokia --

8 A. But they were not required to do so.

9 Q. I'm sorry.

10 A. Sorry. I just added, they were not required to
11 do so.

12 Q. Got you. You understand Nokia contends that two
13 of these patents are essential to both H.264 and H.265?

14 A. Yes.

15 Q. Could we bring up CDX-1321. This is from your
16 slide deck.

17 Nokia's technical contribution regarding the '818
18 patent was made in May 2002. Do you see that?

19 A. It was submitted for the May 2002 meeting.
20 Generally, they were submitted in advance of the meeting.

21 Q. Okay. And that contribution came from Nokia's
22 employee Mr. Hannuksela?

23 A. Yes.

24 Q. He's the inventor of the '818 patent; isn't that
25 right?

1 A. I believe that's correct, yes.

2 Q. And he checked the box saying that the submitter
3 is unaware of any patents associated with that contribution,
4 right?

5 A. The box is checked. I don't know who checked it.

6 Q. So as far as the JVT participants were aware,
7 this technology wasn't going to be patented by Nokia, right?

8 A. That's not correct.

9 Q. Are you aware that Mr. Hannuksela testified that
10 his coinventor ultimately confirmed that their technical
11 contribution did make it into the H.264 standard?

12 A. I haven't seen that, no.

13 Q. Okay. To your knowledge, Nokia never submitted a
14 revised disclosure form to the JVT indicating that it owned
15 patents relating to this contribution? Right?

16 A. Can you call up the language where that's
17 required in the policy?

18 Q. That wasn't my question, sir. Are you aware of
19 Nokia ever submitting a revised disclosure form indicating
20 that it owned patents?

21 A. Are you talking about submitting to the JVT?

22 Q. Yes.

23 A. I'm not aware whether they did or didn't.

24 Q. And the '818 patent wasn't disclosed to the ITU
25 for eight more years, until 2010, right?

1 A. Yes, when the patent was granted.

2 Q. This disclosure came more than seven years after
3 the H.264 standard was approved?

4 A. Yes, that's correct.

5 Q. Seven years after the application was filed?

6 A. I'm doing the math in my head. Yes, and they
7 were not required to identify specific patents to the ITU.

8 Q. Okay. If we could turn back to slide 13.20.

9 Nokia's JVT contribution for the '321 patent also
10 came from Mr. Hannuksela, correct?

11 A. Yes. That's correct, yes.

12 Q. And, in fact, you see this was generated on
13 January 23rd, 2002?

14 A. There's a lot on this form. Could you -- it was
15 for the January-February meeting of the JVT. Could you tell
16 me what you're referring to specifically?

17 Q. Do you see next to the highlighting, the
18 highlighted date, there's a "generated" line?

19 A. Oh, okay. I was looking -- you had the cursor at
20 the bottom. Generated. Yes, it appears -- yeah, 2002,
21 January 23rd.

22 Q. In fact, this was the very same day the
23 provisional application for the '321 patent was filed,
24 correct?

25 A. I'm not certain on the date of that, no.

1 Q. You were here for Dr. Simcoe's testimony
2 yesterday, right?

3 A. Yes.

4 Q. You heard Dr. Simcoe testify to that?

5 A. I don't recall the specific date that he
6 mentioned, no.

7 Q. Okay. Mr. Hannuksela is the named inventor of
8 the '321 patent, right?

9 A. I believe he was the inventor, yes.

10 Q. But this patent wasn't disclosed until 2007, four
11 years after the H.264 standard was approved, correct?

12 A. It's correct in the sense that there was no
13 requirement to disclose specific patents to the ITU.

14 Q. I'd like to turn to H.265 now. During your
15 direct, you showed a chart, a big chart on the easel, of
16 H.265 patent disclosures. That chart didn't have dates on
17 it, right?

18 A. There was no space for dates, yes.

19 Q. Okay. But in your expert report, you had
20 Exhibit D?

21 A. Yes.

22 Q. That did have dates, right?

23 A. Yes, it did.

24 Q. Could we bring up Exhibit D from the expert
25 report.

1 And this is consistent with the slide -- the
2 easel chart that was put up, correct, just includes the
3 dates?

4 A. Yes, we -- yes, it is the same information with
5 the dates of the submission or filing of the patent
6 declaration form to the ITU.

7 Q. And entry number 18, if we could scroll down,
8 that's Nokia's first contribution?

9 A. Yes.

10 Q. Or first disclosure to the ITU concerning H.265,
11 correct?

12 A. Yes, that's correct. It was in June 11 of 2013,
13 several weeks after the standard was approved.

14 Q. And there are nearly 200 patents and applications
15 identified on here, correct?

16 A. Yes, 192, if you do the math.

17 Q. But Nokia employees have been working on the JCT
18 and the H.265 standard since 2010, haven't they?

19 A. The terms of reference for the JCT were agreed in
20 late 2010. I believe the actual work began in 2011.

21 Q. Nokia's employees made lots of technical
22 contributions to the H.265 standard in that time, didn't
23 they?

24 A. They made quite a few, yes.

25 Q. Presumably, these Nokia employees were well aware

1 of the relevance of any of these patents to H.265 before the
2 standard was approved, right?

3 A. Could you repeat that question?

4 Q. Presumably, if the Nokia employees were working
5 on the standard-setting process, they were well aware of the
6 relevance of many of these patents prior to the standard
7 being approved. Would you agree with me?

8 A. I can't speak to what the Nokia employees
9 understood.

10 Q. Okay. But Nokia waited until after the ITU
11 decisionmakers had approved the H.265 standard to disclose
12 these nearly 200 patents and applications, right?

13 A. Yes. And so did most of the companies
14 participating in 265. Only one submitted any specific
15 patent information before approval.

16 Q. The '321 and '818 patents we just discussed
17 weren't disclosed by Nokia as essential until this June 2013
18 date, right?

19 A. Which patents are you referring to?

20 Q. The '321 patent --

21 A. I'm sorry. It's a little -- I'm just having a
22 hard time hearing you.

23 Q. The '321 patent and the '818 patent that we just
24 discussed --

25 A. Yes. Okay.

1 Q. -- that were filed back in the early 2000s. They
2 weren't disclosed as essential to the H.265 until June 2013,
3 after approval of the standard, right?

4 A. They were specifically identified in this
5 declaration that Nokia made in June of 2013. They
6 specifically identified the '818 and the '321 patents under
7 H.265, yes.

8 Q. Okay. Let's turn to the '714 patent. Nokia's
9 H.265 contribution for the '714 patent was submitted in
10 January 2011, just a couple weeks after the provisional
11 application for this patent was filed, right?

12 A. Is there going to be something to see?

13 Q. You don't -- you don't recall?

14 A. Could you please -- I was waiting for something
15 to appear on the screen. Could you repeat that then,
16 please?

17 Q. Could we bring up CDX-13.24 to help Mr. Levin
18 out.

19 A. Yes. And you're referring to which contribution?

20 Q. The '714 contribution.

21 A. Yes. And these were both -- both these
22 contributions were made in 2011.

23 Q. Okay. And this contribution was submitted to the
24 ITU just a couple of weeks after the application for the
25 '714 patent was filed, right?

1 A. Are we talking about submitting to the ITU or
2 submitting to the JCT?

3 Q. To the JCT. I apologize.

4 A. Okay. I don't remember the exact date of this
5 meeting, but it was in 2011, and it was submitted to the
6 JCT, which did not require identification of specific
7 patents.

8 Q. The patent -- or the submission was from the
9 three named inventors of the '714 patent, right?

10 A. I'm not certain who were the inventors. There
11 are three authors of this opinion -- this contribution from
12 Nokia. I don't remember who the inventor of that -- of '714
13 is.

14 Q. Nokia didn't identify any application relating to
15 the '714 patent to the ITU until almost two years later,
16 after approval of the standard, correct?

17 A. I'm not sure what your question is asking.

18 Q. Nokia didn't identify to the ITU any application
19 relating to the '714 patent until almost two years later,
20 after the H.265 standard was finalized, correct?

21 A. Well, in 2013, Nokia indicated that it would
22 license on RAND terms any of its essential patent rights and
23 under H.265. And that's all they were required to do. And
24 they had already indicated in their contribution with '321
25 that they were willing to license on RAND terms.

1 Q. Nokia's H.265 contribution relating to the '267
2 patent, a different patent, also came from the inventors of
3 that patent, correct?

4 A. I don't recall who the inventors were, but I'm
5 not -- I assume that's correct.

6 Q. But Nokia didn't identify any application
7 relating to the '267 patent until almost four years after
8 that submission was done, correct?

9 A. Nokia wasn't required to identify specific
10 patents because they are willing to license. They expressed
11 that in a publicly available formal document in June of
12 2013. They specifically identified the '267 patent. That
13 was in 2014.

14 Q. And that's a year and a half after the standard
15 was approved, correct?

16 A. Yes. And, again, they weren't required to
17 provide that information.

18 Q. You mentioned that Nokia didn't make a technical
19 contribution for the '991 patent. Do you recall that?

20 A. They did not make a contribution, yes.

21 Q. And that application -- or the application for
22 that patent was filed in 2007, right?

23 A. I'm not certain, but it sounds -- I'll take your
24 word for it.

25 Q. And the '991 patent issued in 2011, before the

1 H.265 standard was finalized?

2 A. I believe that's correct.

3 Q. The inventor of the '991 patent is Mr. Lainema,
4 correct?

5 A. I believe that's correct.

6 Q. And Mr. Lainema was intricately involved in the
7 development of the H.265 standard, wasn't he?

8 A. I don't know the extent of his involvement, no.

9 Q. Mr. Lainema went to lots of meetings and made
10 lots of technical contributions?

11 A. I don't know that -- I don't know.

12 Q. You cited many of them in your report, sir. You
13 don't recall that?

14 A. Well, I remember that he attended some meetings.
15 I don't remember how many. There were -- in the period of
16 2011 to 2012, there were more than 12 JCT meetings. So I
17 don't know exactly which meetings Mr. Lainema attended. I
18 did see that he was present at one or two of the meetings.
19 I don't know how much -- from my own experience in the ITU,
20 I don't know how much time he spent at those meetings and
21 what he did at those meetings.

22 Q. Are you aware that Mr. Lainema even attended the
23 ITU meeting in Geneva where the contribution that Nokia now
24 identifies as embodying the '991 patent was made?

25 A. I don't -- I don't recall that.

1 Q. And he attended the meetings afterward where this
2 technology was further discussed, didn't he?

3 A. I don't know that.

4 Q. Now, to be clear, the ITU Patent Policy doesn't
5 just apply to those making technical contributions, right?

6 A. That's very clear in the 2012 version of the
7 policy. There's in Roman numeral II, Section 1 -- and this
8 is a part of the policy that is specific to the ITU -- it
9 clearly recognizes that you can make a patent declaration
10 even if you do not make a contribution. So, yes, that is
11 the case.

12 Q. Anyone participating in the standard-setting
13 activities should identify patents essential to the
14 standard, right.

15 A. No, that's not correct.

16 Q. No, that's not correct? Could we bring up
17 CDX-13.6.

18 Do you see the highlighted language -- and this
19 is your highlighting. It says: "Any party participating in
20 the work of ITU, ISO or IEC should from the outset draw the
21 attention of the director to any known patent or any known
22 pending patent application."

23 Do you see that?

24 A. Yes. And with that --

25 Q. Okay.

1 A. Sorry. I see that, yes.

2 Q. And Nokia didn't identify the '991 patent to the
3 ITU until 2016, correct?

4 A. Well, if we look at the totality of the policy,
5 first --

6 Q. Yes-or-no question, sir.

7 A. Then what's your question?

8 Q. Nokia didn't identify the '991 patent to the ITU
9 until 2016, correct?

10 A. Yes, that's correct.

11 Q. And you don't see any problem with this timeline,
12 do you?

13 A. No, I don't, because, not to repeat our
14 discussion from yesterday, but this language you cite in
15 provision 1 is not mandatory. It's "should." There was no
16 specific time deadline for submitting patent declaration
17 forms.

18 And, again, the fundamental principle, the policy
19 is if you're refusing to license, then you have to identify
20 specific patents. If you're willing to grant a license on
21 RAND terms, you do not have to identify specific patents.
22 And in all -- throughout this proceeding, both in their
23 general declaration and in the specific declarations they
24 filed, before approval of 264 and weeks after the approval
25 of 265, Nokia always indicated that it was willing to

1 license on RAND terms.

2 Therefore, under the policy, they did not have to
3 disclose specific or individual patent information.

4 Q. And I just want to be clear, your opinion here is
5 that even if Nokia knew that it held patents essential to
6 the standard and withheld the identity of these patent
7 rights until after approval of the standard, that wouldn't
8 violate the ITU policy; isn't that right?

9 A. They were not required to identify patents.

10 Q. Lastly, I'd like to turn to the Qualcomm case.
11 You had testified about this in the 1379 investigation,
12 right?

13 A. Briefly, yes.

14 Q. Qualcomm involved both the ITU and the JVT Patent
15 Policies, just like this case, right?

16 A. Yes. And it focused largely on the JVT.

17 Q. And you agree that the JCT, like the JVT, is
18 bound to apply ITU Patent Policy?

19 A. Yes.

20 Q. And you testified in 1379 that, in your view,
21 although the Federal Circuit said there was a disclosure
22 obligation, the Court did not say that the obligation
23 required identification of specific patents. Do you recall
24 that?

25 A. Yes.

1 Q. I want to explore that a little bit. Qualcomm
2 was asserting two specific patents against Broadcom in that
3 case, right?

4 A. So -- I believe that's correct.

5 Q. And they were alleging that the patents were
6 infringed by H.264-compliant products, right?

7 A. I believe that's correct.

8 Q. And in its decision, the Federal Circuit
9 expressly said that the ITU Patent Policy required
10 standard-setting participants to "identify patents embodied
11 fully or partly in a standard under consideration," didn't
12 it?

13 A. I don't recall that part, no.

14 Q. Maybe I can refresh your recollection.

15 A. I do recall where the Court says there is a
16 disclosure obligation, and two sentences later, it says this
17 is not an unambiguous provision.

18 Q. Could -- could we bring up Qualcomm at page 1015.

19 Do you see that, where it says that "the ITU and
20 ISO/IEC Patent Policy provides that any party participating
21 in the work of the ITU, ISO or IEC should identify patents
22 embodied fully or partly in a standard under consideration"?

23 Do you see that?

24 A. Yes. And they are quoting the ITU policy.
25 They're not deciding on the ITU policy at that point.

1 Q. Is it really your testimony that "identify" here
2 doesn't refer to identifying specific patents?

3 A. I still do not find anything in the holding where
4 the Court itself ruled that you have to identify specific
5 patents. And, again, I'm not here to offer legal opinions
6 either.

7 Q. Okay. And, in fact, the Federal Circuit said
8 that this language meant that JVT participants had to
9 disclose patents prior to final approval of the standard
10 under the rules of the ITU. Isn't that right?

11 A. I don't believe that's the exact holding.

12 Q. Okay. Well, let's -- could we go to the top
13 right-hand side corner of this page?

14 "In light of the foregoing" -- and I am reading
15 from this document. "In light of the foregoing, we agree
16 with the District Court that JVT participants also had to
17 disclose patents prior to final approval of the standard
18 under the rules of the JVT parent organizations."

19 That's mandatory language, isn't that, "had to"?

20 A. "Had" is mandatory. And, again, I'm not offering
21 a legal opinion, but in my view, "disclose patents" does not
22 clearly state you have to disclose specific individual
23 patent information or patent application numbers or patent
24 numbers. It just says "disclose patents." And that is not
25 -- I don't think that clearly establishes exactly what is

1 required.

2 Q. Now, you're not aware of the ITU ever issuing a
3 statement saying that the Federal Circuit misinterpreted its
4 Patent Policy here, right?

5 A. I'm not aware that this has ever been discussed
6 at the ITU.

7 Q. Okay. And the ITU hasn't substantively changed
8 its disclosure requirements since the Qualcomm decision,
9 right?

10 A. No. There's one slight change in the disclosure
11 requirements between the 1999 policy and subsequent
12 versions.

13 Q. But nothing that relates to this language here,
14 correct?

15 A. The ITU did not specifically address this
16 holding, as far as I know.

17 MR. RIZZOLO: I have no further questions, Your
18 Honor.

19 JUDGE ELLIOT: Very well.

20 MS. DUCCA: Nothing from Staff, Your Honor.

21 JUDGE ELLIOT: Very well.

22 MR. LIPSCHITZ: Brief redirect, Your Honor?

23 JUDGE ELLIOT: Yes.

24 REDIRECT EXAMINATION

25 BY MR. LIPSCHITZ:

1 Q. Mr. Levin, was Nokia ever required to
2 specifically identify any patent to the ITU?

3 A. No, because at all stages, it indicated that it
4 would license on RAND terms.

5 Q. Let's pull up CDX-13.11.

6 Sir, what are we looking at here?

7 A. This is language from the patent declaration form
8 itself.

9 Q. So this is the form that the ITU provides to its
10 members on which they disclose their -- make their
11 declarations; is that correct?

12 A. Yes, that's correct.

13 Q. Okay. And what does this tell us -- where does
14 this tell us that Nokia wasn't required to submit specific
15 declarations for each and every patent number?

16 A. At the top of the form, it states very clearly:
17 Patent information desired but not required for options 1
18 and 2. And Nokia always checked option 2, which is agreeing
19 to license on RAND terms.

20 Q. And why was the policy designed this way?

21 A. Well, this, again, gets back to the sole
22 objective as stated in the policy itself, and it is endorsed
23 by the entire ITU member states and sector members, that
24 they wanted ITU recommendations or standards to be
25 accessible to everyone, and they did not want them to be

1 blocked by any patent holder that was asserting -- refusing
2 to license their rights to essential rights on RAND terms.

3 So it was to avoid blockage of ITU
4 recommendations by refusals to license.

5 Q. Thank you, sir.

6 MR. LIPSCHITZ: No further questions.

7 JUDGE ELLIOT: Mr. Levin, thank you very much.

8 THE WITNESS: Thank you.

9 (The witness stood down.)

10 JUDGE ELLIOT: Good morning, Dr. Moulin.

11 Whereupon--

12 PIERRE MOULIN,
13 having been previously duly sworn/affirmed, was examined and
14 testified as follows:

15 JUDGE ELLIOT: Let me remind you, you are still
16 under oath.

17 THE WITNESS: Yes, Your Honor.

18 MR. VERBONCOEUR: Your Honor, for its next
19 witness, Nokia calls Dr. Pierre Moulin. May I proceed?

20 JUDGE ELLIOT: Yes.

21 MR. VERBONCOEUR: Thank you.

22 DIRECT EXAMINATION

23 BY MR. VERBONCOEUR:

24 Q. Professor, you testified earlier in this case.
25 So why did you come back?

1 A. Excuse me?

2 Q. You testified earlier in this case. So why did
3 you come back?

4 A. Oh, I'm back here to provide a rebuttal to
5 Dr. Schonfeld's opinions yesterday.

6 Q. Do you have a set of demonstrative slides to
7 assist your testimony?

8 A. Yes, I do.

9 Q. And were you in the courtroom here for
10 Dr. Schonfeld's testimony?

11 A. Yes, I was.

12 Q. Let's have slide CDX-16C.2, please.

13 What opinions did Dr. Schonfeld offer that you
14 plan to rebut with your testimony today?

15 A. Dr. Schonfeld provided opinions about both
16 patents, '267 and '714. For '267, he alleged obviousness
17 over a Walker patent reference, as well as he had alleged
18 that the asserted claims were known, routine, and
19 conventional.

20 Regarding the '714 patent, he alleged obviousness
21 over a combination of a Nakamura proposal and a Working
22 Draft 4 of the JCT-VC. And he also alleged that the
23 asserted claims were well-known, routine, and conventional.

24 Q. Did you analyze the strength of Dr. Schonfeld's
25 opinions?

1 A. Yes, I did.

2 Q. Do you agree with any of Dr. Schonfeld's
3 opinions?

4 A. Not any of them.

5 Q. Are there any claim constructions at issue for
6 the '267 and '714 patents?

7 A. No.

8 Q. Let's have slide CDX-16C.3, please.

9 Professor, is it all right if we start with the
10 '267 patent?

11 A. Sure.

12 Q. Can we start with the Walker argument?

13 A. Yes.

14 Q. And just to be clear, do you agree with
15 Dr. Schonfeld that the '267 patent asserted claims are
16 obvious over the Walker reference?

17 A. No, I do not.

18 Q. Let's have slide 4, please.

19 What is the Walker reference?

20 A. The Walker reference is a patent published in
21 December 2005. So that's a few years after the very popular
22 H.264 standard was released.

23 Q. What is the Walker reference about?

24 A. The Walker reference is about a method and
25 apparatus to form a weighted -- it was called a weighted

1 prediction in bi-prediction coding.

2 Q. Let's have slide 8, please.

3 I'd like to ask you about some figures in Walker.

4 What is Figure 3 here on slide 8?

5 A. So this Figure 3 from Walker depicts
6 motion-compensated coding using one single reference frame.
7 At the lower left, we see a picture to be encoded in black.
8 In that picture, it is what's called a macroblock, typically
9 16-by-16 at the time. And one tries to find a matching
10 block from a previously encoded frame. So that will be a
11 reference frame pictured at the top left of the picture. So
12 there's the other black shaded square over there.

13 And the pixels in that matching block are a good
14 approximation, hopefully, to the current block to be
15 encoded. So the spatial relationship between the two blocks
16 is described by the motion vector, which I've highlighted in
17 red in this picture to clearly show it.

18 And this block then forms a prediction for the
19 current block to be encoded. The difference between the
20 block to be encoded and the prediction is called a
21 prediction error or residual. And that, itself, would be
22 easily encoded if the prediction error is small in some
23 sense.

24 Q. I want to -- you mentioned that you applied the
25 red text and arrows to slide 8?

1 A. Yes, I did. This is a figure from Walker, but
2 the red, the colored red highlights and green arrows are
3 mine.

4 Q. You labeled a box on Figure 3 of Walker
5 "prediction." What is the precision of that prediction?

6 A. So that prediction, which is this red highlighted
7 box there, the pixels in the prediction have the exact same
8 precision as the input. So typically it was 8 bits at the
9 time of H.264. So if the input was 8 bits, for, say, luma,
10 it was the same 8 bits for the prediction.

11 Q. Let's have slide 9, please.

12 I'd like to ask you about Figure 4 of Walker now.
13 What's Figure 4 showing us?

14 A. So Figure 4 extends that concept of motion
15 compensated prediction using now two reference frames. So
16 on the top left, we have the same first reference frame that
17 was shown in Figure 3, but then on the top right, there's a
18 second reference frame with a second matching block.

19 And it often happens that there's a good matching
20 block from the first reference frame and a good matching
21 block from the second reference frame. So they should be
22 combined. And, again, both these reference frames have been
23 encoded and are available to the decoder so the decoder can
24 form the same predictions.

25 So as explained earlier, from the first reference

1 frame one obtains a first prediction, again, highlighted in
2 red. And from the second reference frame, one obtains a
3 second prediction, which is highlighted in blue. And then
4 the idea is to combine those. That's highlighted in green
5 here. There's a combined prediction, which Walker calls a
6 weighted prediction sometimes.

7 So a very simple way to combine or weight is to
8 simply average the first and second prediction. So you add
9 them up and you divide the sum by two. So that will be an
10 instance of a combined prediction.

11 Q. And looking here at your slide 9, you've got red
12 text that says "first prediction" and blue text that says
13 "second prediction." And what is the precision for each of
14 the first and second predictions in Walker, Figure 4?

15 A. The precision for both the first and the second
16 prediction is exactly the same as the inputs precision,
17 which would be 8 bits in this example.

18 Q. And since you've labeled them as such, how do we
19 know that the red block and the blue block on slide 9 are
20 predictions?

21 A. So they are predictions because, as explained,
22 they are obtained from block matching. So the whole purpose
23 of matching is to find a good approximation to the current
24 block to be encoded. So in that sense, the predictions --
25 the idea, again, is that the prediction error, so that's the

1 difference with the current block, should be small. That is
2 what qualifies that to be a prediction.

3 Q. Can we please have slide 10.

4 So I want to ask you about Figure 5 of Walker as
5 well. What's different between Figure 5 of Walker and
6 Figure 4 of Walker?

7 A. Yeah. The only difference is the details in this
8 green shaded box to combine prediction. You observe that
9 there's still a sum of the first prediction and a second
10 prediction, but they are now multiplied by numbers, code
11 weights, $W1$ and $W2$, which could be different. And then the
12 sum is then normalized by $W1$ plus $W2$. So now you have a
13 weighted average.

14 For instance, the first prediction could have a
15 weight of three-fourth, and the second prediction could have
16 a weight of one-fourth only.

17 Q. I've got the same question I've had with the
18 other Walker figures. What are the precisions of the first
19 and second predictions in Walker Figure 5?

20 A. Same answer as for Figure 4. They had the same
21 precision as the input, which would be 8 bits in this
22 example.

23 Q. And you just mentioned that you're calling the
24 red block and the blue block a first and second prediction.
25 What does Walker call those blocks?

1 A. Sorry, which blocks?

2 Q. The red block and the blue block on your slide
3 10, you've called a first prediction and a second
4 prediction. What does Walker describe those blocks as?

5 A. Yeah. He calls them predictions as well.

6 Q. Are there any reference frames that are depicted
7 in Walker Figure 5?

8 A. Yes. As mentioned, top left is the first
9 reference frame, and top right is the second reference
10 frame.

11 Q. So if we were to apply the claim terms of the
12 '267 patent to Walker Figure 5, where would the reference
13 block be, if any?

14 A. So the reference block is comprised -- so the
15 first reference block is comprised of pixels from the first
16 reference frame, so you see this black shaded area there.
17 So the reference blocks comes from that area.

18 And, likewise, the second reference block comes
19 from the second reference frame.

20 Q. And for clarity of the record, when you said
21 black shaded area up there for the first reference block,
22 you're referring to nearby the label 525 on your slide 10?

23 A. That is correct, yes.

24 Q. And, likewise, for the second reference block,
25 you were referring to an area near the label 585?

1 A. That's correct, yes.

2 Q. Mr. Moreno, could we please have RDX-96C.98.

3 Professor, you mentioned you were in the
4 courtroom for Dr. Schonfeld's testimony. Do you recall him
5 discussing this slide?

6 A. Yes, I do.

7 Q. And I see on Dr. Schonfeld's slide, we have
8 equation 13 on the left side and equation 18 from Walker on
9 the right side.

10 Did Dr. Schonfeld rely on these equations for his
11 opinions?

12 A. Yes, he did.

13 Q. How do equations 13 and 18 relate to Figure 5 in
14 Walker?

15 A. Let's look at equation 13 for simplicity. It
16 matches the variable shown in Figure 5. So you remember I
17 mentioned a first and a second prediction. They are called
18 pred0 and pred1 in Walker. So these are the two
19 predictions. And these multipliers, W0 and W1 in the
20 equations, so these are weights. They are typically integer
21 weights.

22 And you see that the prediction is multiplied by
23 the first weight, W0, plus then the second prediction
24 multiplied by the second weight, W1. There's enough sets,
25 and then we see a right shift. So, again, I said W0 and W1

1 are integers, so you need to normalize by the sum, W1 plus
2 W0. That's always a power of 2.

3 So as people of skill in the art know, division
4 by a power of 2 is the same as right-shifting. So this
5 really performs a weighted sum of the two predictions, and
6 then this application of a Clip1 function, which is designed
7 to prevent overflow. There's rare cases of overflow, as I
8 explained on Tuesday.

9 Q. That was equation 13. Can you describe equation
10 18?

11 A. Yes. And just to be clear, what is described in
12 equation 13 is called final pred in Walker. So there's a
13 combined prediction.

14 Equation 18 is really similar, using somewhat
15 different notation, for instance, W0 is called WA. W1 is
16 called WB, and there's no Clip operation.

17 Q. Are your opinions with respect to Walker
18 materially the same for equations 13 and 18?

19 A. Yes, they are.

20 Q. Can we please have slide CDX-16C.11, please.

21 I want to go back to Walker Figure 5 and ask you
22 another question. Can you explain Dr. Schonfeld's theory
23 against the '267 patent in terms of Figure 5?

24 A. Yes. As I mentioned, the red highlighted box in
25 the combined equation are the first prediction and the

1 second prediction as disclosed by Walker. Dr. Schonfeld
2 offers the view that somehow multiplying the prediction by a
3 weight, like one-half, should be a first prediction and,
4 similarly, for the second prediction. And I disagree with
5 that view.

6 Q. Why do you disagree with Dr. Schonfeld's view?

7 A. Well, to give some insight as to why multiplying
8 a prediction by a number like one-half may not be a
9 meaningful prediction, I can offer some examples.

10 Q. Let's have slide 12, please.

11 What are we looking at here on your slide 12?

12 A. Slide 12, I mentioned these weights, W_0 and W_1 .
13 They're usually integers. They sum to a power of 2. So the
14 logarithmic base 2 of that number is an integer, so in this
15 example, from -- in a range 0 to 7, so that will be 3 bits.

16 But, more importantly for my discussion, W_0 and
17 W_1 are called by Walker the weighted factors. And as we
18 see, they're applied to the prediction values, luma or
19 chroma. So this is, again, what Walker refers to as the
20 predictions, which he calls $pred_0$ and $pred_1$. And they are
21 multiplied by W_0 and W_1 . That's what this "applied to"
22 means. It's a multiplication.

23 Q. Can I please have slide 13.

24 We talked about W_0 and W_1 . Does Walker tell us
25 anything about $pred_0$ and $pred_1$?

1 A. Yes. So pred0 and pred1 are the two predictions.
2 And they are, as emphasized, 8 bits, which is the same
3 precision as the input precision.

4 Q. Could we please have slide 14.

5 What are you showing us here from Table 2 in
6 Walker?

7 A. So this is -- in this Table 2, Walker goes over
8 the number of bits used for the different variables in that
9 problem. The most -- the important one is the first line.
10 So we mentioned that the prediction has 8 bits, same as the
11 reference frames and the inputs.

12 The weight in one of his examples is represented
13 by 8 bits. So when you multiply two numbers like this, you
14 get 16 bits, which is quite long. And the same goes with
15 pred1 and W1. When you multiply them, the first one is 8
16 bits, the second is 8 bits, and the product is 16 bits.

17 Q. Let's have slide 15, please.

18 Professor, earlier you mentioned some examples
19 that could help explain your disagreement with
20 Dr. Schonfeld. Are you ready to explain those?

21 A. Yeah. So this is a common sense example of what
22 a prediction might be. So I'm taking an example of a class
23 I may be teaching, like my regular image and video
24 processing class. So my students take exams and they have
25 homework.

1 So this little example, there's three exams in
2 the semester and one set of homeworks. They weight equally
3 15 percent of the total grade. But the final exam counts
4 for 40 percent of the final grade. So let's say I had a
5 student, the grade on all these tests were 100, 84, 89, 95,
6 and 90.

7 So whenever there's weighting, how do you compute
8 it? Well, the first one, 100, gets -- is multiplied by .15.
9 There's a weight. So it's going to contribute 15 points to
10 the final grade. The second exam score, 84, is likewise
11 multiplied by .15, so it's going to contribute 12.6 to the
12 final grade. And so on. And that's how you get the final
13 grade, adding up these weighted numbers, and you get 91.3.

14 So now let's look at prediction. So let's say my
15 students took all three exams and all homeworks, and I would
16 like to predict their final score, final exam score. So I
17 would say, well, the exams and the homework all counted
18 equally, so they count for 25 percent so far. Looking at
19 the four grades I listed, it's reasonable to form a
20 prediction by simply averaging those four numbers. So the
21 grade of 100 will get multiplied by .25. That would
22 contribute 25 points to your prediction. The second exam,
23 84, likewise multiplied by .25, contributes 21 points to
24 your prediction. And so on. So my final -- my final exam
25 prediction score is 92.1, which we see, you know, it's

1 fairly close to the actual score that the student got, 91.3.

2 So not everyone may agree it's a reasonable
3 prediction, but few people would think that, say, 25 was a
4 good prediction of the final score. So this is essentially
5 what Dr. Schonfeld's theory implies, if you take a
6 reasonable prediction like the first one, 100, and you
7 multiply it by a number like .25, somehow the resulting
8 quantity is a meaningful precision. And I categorically
9 disagree with that.

10 Q. I notice here on your slide 15 in your example of
11 prediction, you have weights of 25 percent applied to the
12 exams and the homework. Do those weights have to be the
13 same value?

14 A. No. It would be the same principle and the same
15 conclusions, even if the weights were different.

16 Q. Let's have slide 16, please.

17 So that was Walker. At a high level, can you
18 remind us what the '267 patent is about?

19 A. Yeah. So the '267 patent, which is from 2011,
20 introduces another method that mitigates or reduces the
21 effects of rounding error in bidirectional prediction.

22 Q. Let's have slide 17, please.

23 Were you in the courtroom when Dr. Schonfeld
24 presented these annotated figures from the '267 patent?

25 A. Yes, I was.

1 Q. What is Figure 10 on your slide 17?

2 A. So Figure 10 is taken from Walker. And Figure 10
3 -- well, Figure 10 is taken from Walker, but the colored
4 highlights are from Dr. Schonfeld's presentation.

5 So if we look at the top branch, this is an
6 illustration of bi-prediction again. In the red box, this
7 is an N-tap filter with integer coefficient. So this will
8 be an interpolation filter used to form the first prediction
9 that I mentioned.

10 Then in the blue box, there's a rounding offset.
11 This is for later, either truncating up or down. Then,
12 importantly, shift to input bit depth, so the resulting
13 first prediction P1 has the same precision as the input,
14 right?

15 And likewise for the second branch, second
16 precision, it will be the same operations. And you obtain
17 the second prediction P2, with, again, the same precision as
18 P1 and the inputs. And both are combined, so Dr. Schonfeld
19 called them combined prediction. I agree with that. And so
20 you combine them.

21 And then there's another rounding offset added.
22 And only then is the in put -- then again the input
23 precision is used again by shifting back to that precision.

24 Q. What is Figure 11 on your slide 17?

25 A. So Figure 11 is kind of a representation of the

1 invention. So it looks very similar to Figure 10. There's
2 two significant differences. The most significant
3 difference here is what's highlighted in yellow.

4 So you notice that after forming -- after this
5 interpolation filter, adding the rounding offset now, the
6 result will be shifted to a precision M, which is higher
7 than the input precision. So this is very crucial.

8 So that first prediction, P1, is now at the
9 higher precision than the input, unlike what was done
10 before. And the same goes with the lower branch. So the
11 second prediction, P2, is at the same high precision M.

12 And so these are combined again. Rounding offset
13 is added. In this case, incidentally, it can be signaled in
14 the bitstream in some way. And only then is the sum -- is
15 the combination shifted back to the input precision.

16 Q. If weighting factors were to be used in the '267
17 patent's Figure 11, where would that happen?

18 A. So this is all part of the combined prediction.
19 It could be weights. It could be clipping functions.

20 Q. Let's have slide 19, please.

21 So let's look at the claims of the '267 patent
22 that are at issue in this case.

23 You mentioned you disagree with Dr. Schonfeld's
24 analysis. So what, if any, parts of the asserted claims are
25 missing based on Dr. Schonfeld's Walker reference?

1 A. Yeah. So this is annotating a slide that
2 Dr. Schonfeld showed about rendering the asserted claims
3 obvious. So as he explained, there's a duality of some sort
4 between encoding and decoding claims. In fact, we have the
5 same number of elements, "a" through "g," for instance, and
6 two dependent claims.

7 So let's look at "c," for instance. On the left
8 side, 25c. You see that the first reference block is used
9 to obtain a first prediction, but it must -- it has a second
10 precision, which must be higher than the first precision.
11 And I explained that is simply not present in Walker. So
12 that's a mistake.

13 Second -- and the same goes on the right side
14 with 7C. Second, it's the same concept with the second
15 prediction, so it's also not correct. And then, finally,
16 for "e," the combined prediction based on the first and
17 second prediction, well, if the first and second prediction
18 are incorrectly identified, then so is the combined
19 prediction. So "e" is not correct either.

20 Q. What about the dependent claims, 26, 27, 8, and
21 9?

22 A. Yeah. The dependent claims are just dependent
23 claims. So they pertain to the case where the first motion
24 vector points to a sub-pixel, and so they are also not
25 correctly identified.

1 Q. Can you remind us what Dr. Schonfeld identified
2 as the first and second predictions?

3 A. What he identified as the first and second
4 predictions were the multiplication of what Walker calls
5 prediction, which is what a person of ordinary skill would
6 call prediction, by some weights.

7 Q. In your view, does that process relate to the
8 '267 patent's claims 26, 27, 8, and 9?

9 A. So 26 -- and, again, we have -- the prediction in
10 this case is obtained by interpolation. This is for 26,
11 interpolation using pixel values of the first reference box,
12 so everything I said applies to 26 and to 8.

13 Q. Can we please have slide CDX-16C.3.

14 So we just talked about Dr. Schonfeld's Walker
15 argument. Can we talk about the second argument
16 Dr. Schonfeld has against the '267 patent?

17 A. Certainly.

18 Q. Let's have slide CDX-16C.21.

19 Do you agree with Dr. Schonfeld that the '267
20 patent claims were well-known, routine, and conventional?

21 A. No, I do not.

22 Q. Why not?

23 A. Well, let's talk about the convention also. In
24 fact, at the time, the conventional approach, which looks
25 really obvious, is to represent predictions or some thing at

1 the same precision of what they are meant to represent. So
2 it was -- for over two decades, people in predictive video
3 coding had been representing predictions at the same
4 precision as the input, whether it was uni-prediction or
5 bi-prediction, so using either one or two reference frames.
6 So that was the conventional approach at the time.

7 So if we look at what the '267 patent proposed,
8 so, superficially, one may say, yes, increasing the
9 precision of variables doesn't hurt in terms of, say,
10 compression performance. But, of course, there's a cost,
11 right? You need longer registers, and for hardware video
12 coders, bits are really at a premium. You don't want to use
13 registers that are longer than necessary.

14 So there's a tradeoff between the precision that
15 is used, which, you know, in some way should be larger is
16 better, but then in terms of performance, it's better in
17 terms of, say, coding performance, but it's worse in terms
18 of utilization of the hardware. So that's a well-known
19 concept.

20 So the '267 patent provided, in my opinion, the
21 right tradeoff between precision and performance for this
22 module, okay, for bi-prediction. And it's very important to
23 realize that in video coding, you have a large number of
24 modules. We have been speaking with bi-prediction. There
25 are many other modules, motion compensation,

1 intra-prediction, sample adaptive offsets, register
2 optimization. So they're all -- there's really a myriad of
3 modules. They're highly complex. And how to do a tradeoff
4 has to be a global tradeoff. So it's very simple-minded to
5 say: We are only looking at the tradeoff for one module and
6 ignoring the others.

7 Q. Dr. Schonfeld referred to the '267 patent as the
8 delayed rounding patent. Do you agree with that
9 characterization?

10 A. No. That would be the simple-minded concept I
11 explained. You just focus myopically on one module and not
12 considering the interplay with everything else. Again, in a
13 design of your hardware video coder, you need to consider
14 everything. You don't want to improve the performance of
15 one module at the expense of the others.

16 Q. Do the inventors' standardization activities and
17 contributions that you talked to us about on Tuesday have
18 any bearing on your opinion on whether the claims were
19 well-known, routine, and conventional?

20 A. No, they are absolutely not well-known, routine,
21 or conventional. In fact, the proposal by the inventors,
22 JCT-VC D321, was adopted very early in the Working Draft for
23 the H.265 standards. It was being developed.

24 And an important benefit is that it really
25 unified two different designs that had been used. So, one,

1 lending towards more -- the first lending towards more
2 precision and having a high performance but, again,
3 requiring longer registers and just more hardware, and the
4 low complexity designs, which was much less complex but had
5 somewhat lower performance. And the inventors' proposal
6 actually made it possible to unify those so they didn't
7 exist separately anymore.

8 Q. Let's go to slide 22, please.

9 Can we move on to the '714 patent now, Professor?

10 A. Yes.

11 Q. What opinions did Dr. Schonfeld offer against the
12 '714 patent?

13 A. So he alleged obviousness over a combination of
14 Nakamura and a Working Draft -- the Working Draft 4, and
15 also he alleged that the asserted claims are well-known,
16 routine, and conventional.

17 Q. Do you agree with Dr. Schonfeld's opinions about
18 the '714 patent?

19 A. No, I do not.

20 Q. Can we please have slide 23.

21 Can we start with the Nakamura reference, and at
22 a high level, can you tell us what we're seeing on slide 23?

23 A. Yeah. This was a proposal to the JCT-VC for
24 improving this merge mode that I discussed in my
25 presentation on Tuesday.

1 Q. Let's have slide 24, please.

2 What are we looking at here from Nakamura?

3 A. Yeah. So just as a little reminder, what is the
4 merge mode. So let's look on the left. This is the
5 so-called test model, HM3.0, that was used at the time. So
6 the idea was there's a current block to be encoded. This
7 block in this case has four spatial neighbors labeled A, B,
8 C, D. And if you have a moving object, it is quite likely
9 that the motion vector for your current block might be the
10 same as one or several of the spatial neighbors.

11 And then you want to merge them to improve the
12 efficiency of the encoding of motion information. So
13 Nakamura proposed a different concept, where there's a
14 current block, there's now five neighbors, instead of four,
15 and he also developed his own method for merging modes.

16 Q. Let's have slide 25, please.

17 Now, explain to us what we're seeing here from
18 the Nakamura proposal.

19 A. Yeah. So highlighted in green is that spatial
20 presentation I mentioned with the current block to be
21 encoded and the five spatial neighbors labeled A through E.
22 So Nakamura's idea was to order these spatial neighbors in a
23 certain sequence, so at the bottom we see C, D, A, B, E. So
24 Nakamura visits those four neighbors in that order. And
25 then Nakamura is going to identify up to two so-called

1 spatial candidates for including -- for inclusion in a merge
2 list.

3 So the way this goes in Nakamura is you first
4 inspect the first element of the sequence, which is C.
5 Well, let's say as an example there's no motion vector
6 there. So we just move on to the next. So D, that one,
7 say, has a motion vector there. It's available. So it's
8 instantly selected as the first candidate. You move on.
9 You inspect A. Well, A is intra-coded, which means it
10 doesn't have a motion vector either. So you just keep
11 going. You get to B. B has a motion vector. So that's
12 instantly identified as the second candidate, called S1.
13 Then you don't bother even looking at E. It doesn't matter
14 if there's a motion vector there or not.

15 So that's how Nakamura identifies what he calls a
16 first and a second spatial candidates, S0 and S1.

17 Q. And on slide 25, you've got a green box around
18 something. Why did you put a green box around that?

19 A. Say again?

20 Q. On slide 25, you've got a green box around that
21 diagram you showed you us earlier. Why did you put a green
22 box around that?

23 A. Well, this is to highlight the geometry of the
24 problem, so with the current block in the center. And so
25 this element, this configuration, which is different from

1 what was used in test model HM3.0, was actually adopted by
2 the JCT-VC. However, Nakamura's proposal, the rest of the
3 proposal, was rejected.

4 Q. Let's have slide 26, please.

5 A. Let me clarify that. I want to say the rest
6 pertaining to the merge mode. Yes.

7 Q. And so what we've got here on slide 26, it looks
8 like you've labeled that Working Draft 4. Explain what
9 we're seeing from Working Draft 4?

10 A. Yes. So this is notes from Working Draft 4. So
11 what's highlighted in red there is the decision about
12 Nakamura's proposal, JCT-VC-F419. So it was decided to
13 accept part of his proposal, which is this geometry I showed
14 in green, as well as unifying what's called a merge and the
15 advanced motion predictor mode. But the idea of
16 constructing a list as proposed by Nakamura was rejected.

17 Q. Let's have slide 27, please.

18 What are we looking at here?

19 A. Again, Nakamura's proposal 1 in that table was
20 meant to be an improvement in some sense over the existing
21 test model, HM3.0. So one, let's just compare some
22 important distinctions.

23 So the number of candidates to be put on the
24 merge list was four previously. And Nakamura managed to
25 reduce that to two, which again are called S0 and S1 in his

1 proposal. So he calls these, the two candidates, S0 and S1.

2 If we look at the line before bottom, there's
3 what's called the merging candidate list order. So let's
4 focus on the right side. With Nakamura, the list contains
5 possibly the two spatial candidates, S0 and S1, as I
6 discuss, as well as a third candidate. "Col" stands for
7 colocated. That's from another reference frame which is not
8 an issue in this discussion. So the merge list in Nakamura
9 has up to three candidates.

10 And then, finally, the last step, trying to
11 remove redundant candidates, trying to remove duplicates
12 from the list. So Nakamura does a full comparison. There's
13 three quantities. So to compare them you need to compare
14 three pairs, right? S0 versus S1, and then S0 versus Col,
15 and, finally, S1 versus Col. So there are three comparisons
16 performed in Nakamura, all possible pairs, where in the
17 previous test model, HM3.0, there were four -- up to four
18 elements in this. So that required actually ten
19 comparisons.

20 So the big selling point of Nakamura was that,
21 well, I need three where the previous art needs ten. But
22 that was not enough to be accepted by JCT-VC.

23 Q. And I apologize if I missed this, Professor, but
24 what does Nakamura identify as the spatial candidates?

25 A. The spatial candidates are called S0 and S1 on

1 this -- in this table, as well as on the previous slides.

2 Q. And maybe this is an obvious question, but how
3 many different comparisons can you make between S0 and S1?

4 A. Only one, right? It's only one pair, so only one
5 comparison is good enough.

6 Q. Can we please have slide 28.

7 At a high level, can you remind us what the '714
8 patent is about?

9 A. Yeah. So the '714 patent is intended to reduce
10 the complexity of a merge list construction. And so the
11 idea is that, well, you might have a large set of
12 candidates, but you're going to perform a limited number of
13 comparisons between the candidate pairs to remove possible
14 duplicates.

15 Q. Can I have slide 29, please.

16 And at a high level again, what are we looking at
17 here from the '714 patent?

18 A. Yeah. So this is -- on the left side, we have
19 the same geometry, and now the spatial adjacent blocks are
20 colored. You see A0, A1, B0, B1, B2. They each have a
21 color.

22 On the right side, there's a flow chart that
23 describes how these limited comparisons are made. The
24 maximum possible number is six, where if you did a full
25 comparison using every possible pair, you would need ten

1 comparisons.

2 Q. And I'd like to ask you a question about
3 something on slide 29.

4 What does Figure 8B mean by "insert the candidate
5 into the list"?

6 A. Yes. So whenever a candidate has survived these
7 tests, that candidate is added on the list. So, initially,
8 the list is empty and then gradually you build it up using
9 the candidates that have survived those tests. And I should
10 also mention that as another example here, this Figure 8B,
11 all these comparisons can be made in any order, as disclosed
12 by the inventors.

13 Moreover -- that was also a pretty neat point --
14 this process can be implemented using parallel processing.
15 So that's a -- can be very efficient.

16 Q. Let's please have slide 31.

17 Based on your analysis, what limitations of the
18 asserted claims, if any, are missing from Dr. Schonfeld's
19 Nakamura combination?

20 A. Yeah. So this Nakamura combination fails with
21 regard to elements c, d, and e, again with the coding claims
22 on the left and encoding claims on the right. And there's
23 some duality between them. So whatever I say about 23c
24 applies to 15c, and similarly with d and e.

25 So 23 fails, determine a subset, because no such

1 thing is done in Nakamura, in the Nakamura combination. 23d
2 fails because it says "without making a comparison of each
3 possible candidate pair from the set of candidates." Well,
4 Nakamura has only two candidates, and it needs to do one
5 comparison. So that fails to meet "d." And regarding "e,"
6 likewise, so that test fails for the same reason.

7 And the same goes on the right side for the
8 encoding claims -- I'm sorry, let me correct that. 23e, so
9 here this is about including or excluding a candidate where,
10 in Nakamura, a large list is first constructed and then
11 items are removed from the list. So that is completely
12 different.

13 Q. Let's have slide 32, please.

14 Dr. Schonfeld opined that the '714 patent
15 asserted claims were well-known, routine, and conventional.

16 Do you agree?

17 A. I do disagree.

18 Q. Why do you disagree?

19 A. Well, first of all, this part of the merge list
20 construction was recognized to be a very important problem
21 in the development of the H.265 standard. In fact, it was
22 identified as a core experiment. And so this was -- it was
23 really needed to find a good solution to the problem that
24 had been disclosed in JCT-VC documents. And the '714
25 invention, basically, solved that problem, okay? The

1 invention was adopted, so that essentially solved the
2 problem. And it was adopted into the standards.

3 There are many benefits to this type of -- to
4 this invention. So, first of all, because a limited number
5 of pairs is evaluated, say, for instance, six as opposed to
6 ten, that's a reduced computational burden. So, again,
7 hardware video coding, coders are very complex, and being
8 able to reduce unnecessary computations or computation that
9 have a pretty limited value is really important for
10 efficiency.

11 So the '714 invention managed to do that. Again,
12 because fewer comparisons are needed, that reduces the
13 complexity of the hardware. And, moreover, these operations
14 can be performed in parallel to some extent, which is
15 another important benefit.

16 Q. Now, I might be paraphrasing a bit, but I recall
17 that Dr. Schonfeld characterized the '714 patent as
18 comparing fewer things. Do you agree with that
19 characterization?

20 A. It's a very simple-minded comparison because, as
21 I said, you first need to come up with a set of candidates,
22 find a nifty way to have the right kind of comparisons. And
23 there are tradeoffs, right? Doing a limited number of
24 comparisons possibly can have an impact on coding
25 performance.

1 Again, this is a module in a very complex system.
2 And it was -- the JCT basically recognized the value of this
3 proposal. It's a very good idea. Even if you look at the
4 global tradeoff, it goes well beyond looking myopically at a
5 single tradeoff.

6 Q. Let's have slide 33, please.

7 What are you showing us on slide 33, Professor?

8 A. Yeah. So this is an illustration of how
9 significant and frequently used the '267 and '714 patents
10 are.

11 So on the left side, I'm listing some videos that
12 were provided by the Respondents. And so this table
13 provides some information. If you look at the fourth
14 column, it shows, if you look at all coding units in H.265,
15 what percent of those coding units use a merge mode. And we
16 see the numbers range from 29 to 50 percent. So it's very
17 often used. And so that's for the '714 patent.

18 And if you look at bi-prediction, if you look at
19 the prediction units that are -- use bi-prediction, you find
20 likewise they're used very often. That's the last column of
21 the table. And the numbers there range from 41 to
22 65 percent.

23 Q. How, if at all, does your testing analysis relate
24 to your opinion that you just provided us that the asserted
25 claims are not obvious?

1 A. Yeah. So because these merge modes and
2 bi-prediction are used so often, if you just -- of course,
3 there was a lot of interest, right? They are used often.
4 It's a very important problem. So if it was obvious, the
5 solution would have been discovered a long time ago. Again,
6 bi-prediction has been around for two decades by the time
7 H.265 came up. So if it was obvious, it would have been
8 discovered well before then. These are very important
9 problems.

10 Q. Thank you, Professor.

11 MR. VERBONCOEUR: Your Honor, I pass the witness.

12 MR. CANAVERA: May I proceed, Your Honor?

13 JUDGE ELLIOT: Yes. How long do you think you'll
14 be?

15 MR. CANAVERA: Probably 25 minutes.

16 JUDGE ELLIOT: Very well. All right, go ahead.

17 CROSS-EXAMINATION

18 BY MR. CANAVERA:

19 Q. Good morning, Dr. Moulin.

20 A. Good morning, Mr. Canavera.

21 Q. Let's begin by talking about your '267 invalidity
22 opinions and the Walker reference.

23 A. Okay.

24 Q. Could we bring up CDX-16C, page 14.

25 This is Table 2 of Walker. Is that right?

1 A. That's correct.

2 Q. You discussed this in your direct testimony?

3 A. That's correct.

4 Q. And Table 2 shows a list of operations used in an
5 encoding process. Is that right?

6 A. That's correct.

7 Q. And Walker is showing a bidirectional prediction
8 process in Table 2, right?

9 A. Well, Table 2 aims to show the number of bits
10 that are used for different variables in this process.

11 Q. And this is bidirectional prediction?

12 A. Yes.

13 Q. And on this slide, you've highlighted pred0 and
14 pred1, correct?

15 A. Correct.

16 Q. I think you said pred0 and pred1 are predictions,
17 correct?

18 A. That's correct.

19 Q. And --

20 A. Sorry. Walker as well, okay?

21 THE REPORTER: Sorry?

22 THE WITNESS: I said, Walker as well. Not just
23 me.

24 BY MR. CANAVERA:

25 Q. And from this slide, you would agree pred0 and

1 pred1 are 8-bit values, right?

2 A. In these examples, yes, in Table 2.

3 Q. And you see on the left-hand side, we have these
4 operation numbers listed?

5 A. Yes.

6 Q. And so if you look at operation 1, those 8-bit
7 predictions are multiplied each by an 8-bit weight, right?

8 A. Correct.

9 Q. And you get, as depicted on the right-hand side,
10 a 16-bit value for each of those, correct?

11 A. That's correct.

12 Q. Now, if you go down to prediction -- or, pardon
13 me, to operation 3, those two 16-bit values that we got in
14 operation 1 are added together, correct?

15 A. Correct.

16 Q. And that creates an 18-bit value?

17 A. Yes.

18 Q. And then if you look at operation 4, do you see
19 that that sum coming out of operation 3 is right-shifted
20 down to a 10-bit value?

21 A. That's correct.

22 Q. So in the results coming out of Table 2, the
23 final value is an 8-bit weighted prediction, correct?

24 A. Not in operation 4.

25 Q. The result of the entire process of Table 2?

1 A. Oh, upon completion of operation 6, you mean?
2 Yes, it's 8 bits.

3 Q. 8-bit weighted prediction, correct?

4 A. The -- yeah, what Walker calls the weighted
5 prediction and that both Dr. Schonfeld and I call combined
6 prediction has 8 bits.

7 Q. And that's the output of the process depicted in
8 Table 2?

9 A. That's correct.

10 Q. So Table 2, the inputs are two 8-bit predictions,
11 correct?

12 A. You mean you put to the table?

13 Q. To the process in Table 2.

14 A. Well, there are multiple inputs. There's the two
15 predictions, there are weights, there are the offsets.

16 Q. So the inputs to the process of Table 2 include
17 two 8-bit predictions, right?

18 A. It does, yes.

19 Q. The output is an 8-bit weighted prediction,
20 right?

21 A. That's correct.

22 Q. And I think, tell me if this is right, the
23 opinion you gave earlier was that during the process of
24 Table 2, the reason you disagree that Walker renders the
25 claims obvious is because when you multiply the prediction

1 by a weight, it's no longer a prediction, correct?

2 A. Well, for many reasons, which I have stated. So
3 one reason is that multiplying a prediction by a weight like
4 one-half is not a prediction. Walker does not call that a
5 prediction. It's not a prediction like -- as my example
6 showed. So that is definitely not a prediction.

7 Q. Can we bring up CDX-12C.55.

8 You recognize this slide from your testimony on
9 Tuesday?

10 A. Yes.

11 Q. And you discussed this slide in describing why
12 the accused products practice H.265?

13 A. That is correct.

14 Q. And why H.265 infringes the claims, right?

15 A. Say again?

16 Q. You discussed this slide in discussing why you
17 believe H.265 infringes the claims, right?

18 A. So I discussed this slide to show that the
19 accused products infringe the claims, yes.

20 Q. And your infringement opinions based on H.265
21 relied on two portions of H.265 that deal with weighted
22 sample predictions, right?

23 A. I used those to form my opinions.

24 Q. Can we take this down?

25 And now talking about AV1, for AV1 infringement

1 opinions, you also relied on weighted sample predictions as
2 part of your infringement opinions, correct?

3 A. Could you point to a particular equation maybe?

4 Q. Could we pull up Dr. Moulin's deposition at
5 505:21 to 506:2.

6 Do you see at the bottom of the page there at
7 line 21, you see the question was -- and this is from your
8 deposition -- "You also relied on weighted sample prediction
9 in AV1 as part of your infringement opinions; is that
10 right?"

11 And you answered: "That is correct."

12 That was the testimony you gave?

13 A. Yeah, that is correct. Yes.

14 Q. So could we bring up CDX-16C, page 17.

15 You talked about this briefly just a few moments
16 ago, right, this slide?

17 A. Correct.

18 Q. I wanted to clarify just a few details about your
19 discussion. Do you see in Figure 10 the left-most boxes,
20 they're listed as N-tap filters?

21 A. Yes.

22 Q. And in Figure 11, you see those left-most boxes
23 are labeled as P-tap filters?

24 A. Yes.

25 Q. There's no substantive difference between the

1 N-tap filter and the P-tap filter in these two diagrams, is
2 there?

3 A. No, N and P are just the main integer parameters.
4 Typically, they would be equal to, say, 2, 6, or 8. It's
5 just a placeholder.

6 Q. Now, in Figure 11, the use of a P-tap filter
7 increases the precision of the input pixels, correct?

8 A. Well, we have to be careful about the way we
9 formulate that statement. So let me explain.

10 So it's a P-tap filter. If you remember the
11 weights are integers, typically. So this is done both in
12 Walker and in standards like H.265. So you multiply the
13 inputs with integers, and then later you divide by a power
14 of 2, which is equivalent to right-shifting.

15 So when you multiply the input samples which have
16 the first precision, say, 8 bits, with integers, you need
17 more bits to cover this weighted sum, correct, and so, yes,
18 that is why you need a higher precision. Otherwise, you're
19 going to lose information.

20 Q. And the same would be true of the N-tap filters
21 in Figure 10, right?

22 A. Correct, yes.

23 Q. Let's talk about your opinions on the '714
24 patent -- we can take this down -- and the Nakamura prior
25 art reference.

1 Nakamura was a proposal to the JCT-VC, right?

2 A. That's correct.

3 Q. And it's fair to say Nakamura was proposing to
4 modify merge mode as then described in WD 3; is that fair?

5 A. Say again?

6 Q. Is it fair to say that Nakamura in its proposal
7 was describing how to modify Working Draft 3?

8 A. I wouldn't characterize it that way.

9 Q. Nakamura was proposing how to make changes to the
10 then current working draft of H.265, right?

11 A. So HM3.0, if that's what you're asking about, or
12 WD 3 documents or words that involve many, many components.
13 So Nakamura was only focused on the merge mode and the MVP.

14 Q. And Nakamura was proposing to change those
15 portions of --

16 A. Yeah, only those portions.

17 Q. And Nakamura described some proposed
18 simplifications in the generation of a motion vector
19 candidate list, right?

20 A. He proposed his own technique for generating a
21 motion vector prediction candidate list, which was different
22 from what had been done in the past.

23 Q. And those were -- Nakamura proposed a way to
24 reduce the number of comparisons made when removing
25 redundant candidates from the motion vector prediction list.

1 Is that fair?

2 A. Say it again?

3 Q. Nakamura was proposing a way to reduce the number
4 of comparisons when removing candidates from the motion
5 vector prediction list?

6 A. Well, Nakamura proposed a very specific
7 technique, okay? So he proposed two spatial motion
8 candidates, called S0 and S1, and then you add the temporal
9 candidate, Col, C-o-l. And then you have three elements,
10 and then you reduce the size of that list by removing
11 components. That's what, in a nutshell, Nakamura proposed.

12 Q. And one of the goals of Nakamura was to reduce
13 the number of times the comparisons are performed in forming
14 that list, right?

15 A. Nakamura is trying to -- the goal really was to
16 have a small number of comparisons at the end, which was at
17 most three.

18 Q. I want to talk to you about the way Nakamura
19 builds its motion vector prediction list. You agree that
20 Nakamura selects two spatial neighbors as candidates, S0 and
21 S1?

22 A. Correct.

23 Q. And you agree that Nakamura compares the spatial
24 neighbors S0 and S1 to each other, right?

25 A. S0 and S1 are motion vectors, and they are

1 compared with each other.

2 Q. So Nakamura proposes -- compares S0 and S1?

3 A. If they exist.

4 Q. So if they exist, Nakamura compares S0 and S1?

5 A. Yes. Yes.

6 Q. And you agree that if S0 and S1 have the same
7 motion information, S1 is removed from the merge list?

8 A. Can you go back to the Nakamura proposal?

9 Q. Sorry --

10 A. There are three -- so you end up with three,
11 right, S0, S1, and Col, on the list. He -- when there are
12 duplicates, I can't recall right here which one is removed.
13 It doesn't matter anyway because that proposal was rejected
14 a long time ago.

15 Q. We agree S0 and S1, if they exist, are compared
16 to each other, right?

17 A. Yeah, but if both exist as is your assumption,
18 you asked me which one Nakamura removes from this list, and
19 I don't remember which one. It doesn't matter anyway
20 because this was rejected.

21 Q. So fair to say Nakamura removes one of the two
22 from the list, if they have the same motion information?

23 A. Yes.

24 Q. But if I understand your opinions earlier today
25 about why Nakamura does not render the claims obvious, is it

1 fair to say that Nakamura does not disclose excluding a
2 candidate from the motion vector prediction list?

3 A. There are several reasons why I gave my opinion.
4 So one reason is, first, all possible pairs are compared in
5 Nakamura construction. So that is completely unlike the
6 '714 patent. And can you restate your question again? I
7 want to make sure.

8 Q. Yeah. I want to focus on a particular claim
9 element. Can we bring up the '714 patent, claim 23.

10 Could you focus on the "determine to include or
11 exclude" limitation? Second from the bottom. I think you
12 said Nakamura does not render this element obvious, right?

13 A. Let me read this again. Yeah, that's correct.

14 Q. And was the basis of that opinion that while
15 Nakamura removes candidates from the list, it does not
16 exclude candidates from the list?

17 A. Yeah, removing is not the same as excluding or
18 including.

19 Q. So the distinction you're drawing is if I have
20 data of the candidate, the claim requires that I don't let
21 it go on the list; whereas Nakamura, that data is on the
22 list and takes it off? Is that fair?

23 A. Say again?

24 Q. The distinction you're drawing is whether or not
25 to stop the data from going on the list or whether you take

1 it off after it's already on. Is that fair?

2 A. Well, you're describing the difference between
3 excluding and removing. So, yes, Nakamura has a list that
4 he has constructed and then he prunes it. So he -- yes.
5 That's what he has done, Nakamura. Nothing is ever added to
6 the list or excluded from the list.

7 Q. Okay. So you would say that for the -- let me
8 ask about H.265 for a moment. For the H.265 merge candidate
9 list, you would agree, wouldn't you, that it would be
10 inefficient to have a long list with many candidates and
11 have to spend bits signaling which one, right?

12 A. I do agree, yes.

13 Q. And H.265 merge mode reflects the idea that
14 duplicates should be eliminated, right?

15 A. Correct.

16 Q. And in H.265, making the list shorter is very
17 important for efficiency in video coding. Is that fair?

18 A. It is important, yes.

19 Q. So in H.265, trying to remove duplicates in that
20 case is very important. Is that fair?

21 A. When you say "remove duplicates," it's at an
22 abstract level, right? So H.265 is a standard. It's a
23 decoding standard. If you look at the decoding steps in the
24 standard, you gradually build a list. There's nothing
25 that's ever removed in the standard, right?

1 So when you say -- just to be clear, when you say
2 remove redundancy, it's a conceptual level. If you look at
3 the steps in H.265 for decoding, you observe that the merge
4 list is gradually constructed, just like in the '714 patent.

5 Q. So at least at the conceptual level as you're
6 describing it, H.265 does remove duplicates, right?

7 A. At the conceptual level, the idea of having a
8 short list -- there's never any removal, neither in the
9 H.265 decoding standard or in the patent. You never start
10 from a large list and you remove things. The goal is to not
11 have duplicates in the list.

12 Q. At a conceptual level -- I'm just using your
13 terminology --

14 A. Yes. Yes.

15 Q. -- H.265 removes duplicates when building a merge
16 candidate list, right?

17 A. I wouldn't put it that way. I mean, clearly,
18 H.265 has a decoding process with very clear steps. You
19 start from an empty list and then you gradually add elements
20 to it. And nothing is ever removed from that list.

21 Q. So you wouldn't agree with that statement I just
22 made?

23 A. I think it's not a proper way to characterize it.

24 Q. Do you remember on day 2 when you were describing
25 infringement, you gave a background on how merge mode works

1 in H.265?

2 A. Say again?

3 Q. Do you remember on day 2 of this hearing --

4 A. Yes.

5 Q. -- you gave opinions on infringement and you
6 discussed the background of how merge mode works?

7 A. Yes.

8 Q. Could we bring up the day 2 transcript, 484,
9 lines 22 to 23.

10 So do you see here that on day 2, when giving the
11 background on merge mode and why that infringes, you said:
12 "Trying to remove duplicates in that case is very
13 important."

14 A. Well, can I see what the case is? I don't see
15 the context.

16 Q. Can we zoom out?

17 Right there. Do you see that the paragraph that
18 precedes that are the questions I just asked you. And you
19 only disagreed with me when I used the word "remove," as you
20 did on Tuesday. Is that fair?

21 A. Well, as in that case, I still don't see what the
22 case is. I see line 12, yes, but I don't see what's above
23 line 12. What is the case?

24 Q. Let's go on to another issue on Nakamura.
25 Do you remember -- we can take this down.

1 Do you remember when we talked on Tuesday about
2 how many comparisons you could do in a set of -- if there's
3 five elements in the set?

4 A. Yes, I do.

5 Q. And you agreed that to compare each pair in the
6 set of five, you would need to do a maximum of ten
7 comparisons. Is that fair?

8 A. I agree.

9 Q. So can we bring up RDX-0122C.6.

10 This is a slide that I prepared just comparing
11 two things here for you. Do you see, on the right-hand
12 side, that this is the spatial neighbor diagram from
13 Nakamura?

14 A. Yes.

15 Q. And do you see, on the left, this is the spatial
16 neighbor diagram from H.265?

17 A. Yes.

18 Q. And I think you said on Tuesday that in H.265,
19 there are five spatial neighbors used in H.265. Is that
20 fair?

21 A. Correct.

22 Q. And in Nakamura, there are five spatial neighbors
23 as well, correct?

24 A. Correct.

25 Q. And you agree that Nakamura uses the same five

1 spatial neighbors as H.265, correct?

2 A. Correct.

3 Q. And you agreed with me just a moment ago, I
4 believe, that Nakamura at least compares two of those
5 spatial neighbors, if they exist, right?

6 A. No, Nakamura compares only motion vectors. It
7 doesn't make sense to compare spatial neighbors. Spatial
8 neighbors are just locations, block locations in a picture.
9 They're quantities that compare the motion vectors.

10 Q. You agree that Nakamura compares the motion
11 vectors for at least two of those spatial neighbors, if they
12 exist, right?

13 A. For at most, not at least. Nakamura compare S0,
14 S1, if they exist, so that's at most two, not at least two.

15 Q. Okay. If I said "at least two," then -- that's
16 fine, "at most" is fine.

17 A. Yeah.

18 Q. And you agree that in H.265, there are at most
19 five comparisons between the motion vectors of the spatial
20 neighbors. Is that fair?

21 A. At most, yes.

22 Q. And let's get the wording right, but you agree
23 that in Nakamura for motion vectors at the spatial neighbor
24 locations, there would be at most one comparison? Is that
25 the right wording for that?

1 A. Well, there are at most two candidates in
2 Nakamura. If there are two candidates, there is one
3 comparison. If there's only one candidate, there is no
4 comparison. And there's no candidate, there's no comparison
5 either. So there's at most one comparison.

6 Q. Okay. And now, in terms of your opinions you
7 just gave on obviousness in Nakamura, did I understand you
8 right that you said that Nakamura does compare every
9 possible candidate pair. That's fair?

10 A. Nakamura has at most S0 and S1 on this list, and
11 he does compare every one.

12 Q. If it's one comparison and the five spatial
13 neighbors, Nakamura compares every possible candidate pair,
14 right?

15 A. Nakamura has at most two candidates, S0 and S1,
16 wherever they come from, and just compares them, one
17 comparison.

18 Q. And for H.265 in your infringement opinions, you
19 agree that with its five comparisons amongst those spatial
20 neighbors, that does not compare every possible pair. Is
21 that fair?

22 A. That is correct, yes.

23 Q. Thank you, sir.

24 MR. CANAVERA: I pass the witness.

25 MS. DUCCA: No questions from the Staff, Your

1 Honor.

2 JUDGE ELLIOT: Very well. Mr. Verboncoeur, how
3 long will you be?

4 MR. VERBONCOEUR: No redirect, Your Honor.

5 JUDGE ELLIOT: Oh, very good. All right.

6 Dr. Moulin, thank you very much.

7 THE WITNESS: Thank you, Your Honor.

8 JUDGE ELLIOT: All right. Let's take our morning
9 break. I have 10:37. Let's come back at 10:55, 10:55.

10 (A recess was taken at 10:37 a.m., after which
11 the proceedings resumed at 10:55 a.m.)

12 JUDGE ELLIOT: Have a seat.

13 All right. Dr. Orchard is next?

14 MR. LIPSCHITZ: Yes, Your Honor.

15 Whereupon--

16 MICHAEL ORCHARD,
17 having been previously duly sworn/affirmed, was examined and
18 testified as follows:

19

20 JUDGE ELLIOT: Good morning, sir. Let me remind
21 you, you are still under oath.

22 MR. LIPSCHITZ: Your Honor, may I proceed.

23 JUDGE ELLIOT: Yes.

24 DIRECT EXAMINATION

25 BY MR. LIPSCHITZ:

1 Q. Hello, Dr. Orchard. Welcome back.

2 A. Hello.

3 Q. Would you please summarize your opinions for us
4 today?

5 A. Today I will be offering opinions that Koga does
6 not invalidate the asserted claims because it does not
7 practice the elements shown in the independent claims, in
8 the first line there, and it does not practice the dependent
9 claims, 29 and 38.

10 Q. Okay. And can you remind us what are the
11 asserted claims, sir?

12 A. The asserted claims are claim 22, 31, 29 and 38.

13 Q. Are there any differences between the method and
14 apparatus claims relevant to your analysis?

15 A. No, there aren't.

16 Q. Can you remind us how prediction works in video
17 decoding?

18 A. As mentioned in my earlier testimony, motion
19 vectors are received and with those motion vectors alone the
20 current frame prediction shown to the left is created. And
21 then bits are received to uncode -- to decode the prediction
22 error in various portions to create the middle coded
23 prediction error. You add the two together and create the
24 decoded frame.

25 Q. Okay. Let's turn to the context of the problem

1 addressed by the inventors. How are prediction error
2 signals traditionally decoded in the prior art?

3 A. They are traditionally decoded using transforms
4 as described in my earlier testimony. What is shown in the
5 middle is like a palette of different patterns. We get to
6 choose how much of the different patterns to use and add
7 together, so the numbers there indicated how much of this
8 particular combination is used to create the combination on
9 the right.

10 And we noted that the result on the right is a
11 pretty good approximation to what is on the left. It is not
12 exactly, but it's notable because we were able to make that
13 block of 256 pixel values with using only ten numbers.

14 Q. Okay. And what's the problem that the inventors
15 were trying to solve?

16 A. As efficient as what I just showed was, it
17 doesn't work so well when you have prediction images that
18 look like that. And the difference of this prediction
19 image, it has a very strong outlier shown right in the
20 middle.

21 And if you try to do what we just did in the
22 earlier example, you would find you have to use a lot of the
23 palettes and a lot of numbers contributing a lot of things
24 from the palettes. And the reason for that is that single
25 dot does not look in any way, is not correlated with any of

1 the palettes available for painting this picture.

2 Q. Does this have any relation to the problem that
3 the prior art, Koga, was trying to solve?

4 A. No, it's totally unrelated to the Koga
5 contribution.

6 Q. How did the inventors propose to address this
7 problem?

8 A. They proposed to take the two pieces apart, have
9 one part that's represented as transform and that will just
10 recover the part that is nice and smooth and for which
11 transform works well.

12 Then for the spatial outliers, to send them as
13 spacial information, so send information that allows you to
14 reconstruct the spatial information, add the two together
15 and that way you create the coded prediction error on the
16 right.

17 Q. Okay. Can we please pull up JX-10 and let's go
18 to the abstract.

19 How do we know the inventors had in mind the idea
20 that spatial samples would generally only apply to isolated
21 outliers?

22 A. Well, it permeates the description of the patent
23 starting in the abstract. If you look at the bottom
24 sentence, it says the effects of pixel outliers are removed
25 from the transform and are coded separately as a spatially

1 coded pixel prediction, thereby improving the coding gain of
2 the transform.

3 So it attributes the improvement in gain both of
4 the transforms and of the spatial because of removing,
5 separating outliers.

6 Q. Let's go to 5, 24 to 50.

7 Does the patent give any examples where spatial
8 samples are only generated for the outliers?

9 A. Yes. In this section, it refers to Figure 4
10 which is one encoder algorithm. In the description of this,
11 you can see throughout this paragraph that it refers to
12 outliers, outliers, outliers. And it is telling you to find
13 the outliers, do things with the outliers.

14 And ultimately at the bottom, it notes that
15 spatial coding is applied involving quantization and entropy
16 coding without transform to the difference between the
17 original outlier values and the transform decoded outlier
18 values. You recognize that what it's telling you to
19 spatially code are just those values or a difference
20 calculated at those outlier locations.

21 Q. Let's go to 3, 55 to 62. If we could also pull
22 up 4, 50 to 58. Does the '991 patent consistently discuss
23 using individualized spatial samples?

24 A. Absolutely. We saw it in the abstract. That
25 last thing I think was from column 5. I just pointed or

1 brought this out because they are from column 3 and column
2 4. And in all of them, the discussions highlight the fact
3 that the advantages of this are based on the fact it uses
4 single spatial samples in its spatial -- as the information
5 embedded in spatial information.

6 Q. Let's go to Figure 2, please.

7 Can you remind us how this example worked here
8 with reference to this outlier that we see here?

9 A. Again, from my original testimony, it showed --
10 it illustrated the idea with an example that had a common
11 very nice pattern of four ones directly across, except one
12 of them, the third sample was an outlier, it's much
13 different than the other samples. And it showed that if you
14 just ignore the fact that outlier is there, you still -- in
15 2B -- you can code it but you would use four different
16 transform coefficients and it illustrates a combination of
17 the four that, in fact, perfectly represents that.

18 But it notes that on the right you could
19 alternatively just show one transform coefficient. That
20 would be the one that represents 1, 1, 1, 1, across and then
21 add to that just a spatial outlier at the third sample and
22 that also would represent that with only two numbers rather
23 than the four numbers you would use in the 2B.

24 Q. Let's go to 6, 5 to 19. You mentioned earlier
25 one encoder algorithm described in the '991. Are there

1 other algorithms that place the same importance on using
2 isolated spatial samples?

3 A. Elsewhere -- further on in the patent in the
4 specification there are a lot of descriptions of other more
5 sophisticated ways of determining what the transform and
6 spatial elements are. And so this says the encoder can use
7 different strategies to find the desired transform
8 coefficients and spatial samples.

9 In the middle there it offers some strategies but
10 maybe the most sophisticated one is on the bottom. It says
11 an encoder can also iteratively modify transform
12 coefficients and/or spatial samples in order to improve the
13 coding performance until a desired performance or a maximum
14 number of iterations is achieved.

15 So the suggestion there is to do more
16 sophisticated work to just try adjusting the transform
17 coefficients and the samples, spatial samples such that you
18 use as little bit rate as possible and a person of ordinary
19 skill in the art would be -- would know that is just a more
20 sophisticated way of even lowering the number of spatial
21 samples and transform coefficients.

22 Q. What does this lead you to conclude about the
23 role of spatial samples in the '919 patent?

24 A. That consistently throughout the '991 patent, the
25 core of the idea is that spatial samples -- few spatial

1 samples representing outliers are what are intended to be
2 coded for the spatial information, and it's intended to
3 allow us to remove those few samples so that transform
4 coding can work better on the remaining material.

5 Q. Let's go back to the slides, please, CDX-15C.9.
6 Thank you.

7 Now, this is the block diagram you showed us
8 earlier this week. Now, why do you only show three spatial
9 samples on there?

10 A. I am just illustrating the fact that spatial
11 samples are meant to represent outliers. Earlier examples
12 just used one. I used just a small number 3. I show it on
13 the right-hand side as three outliers spread out through the
14 block.

15 Q. How are the spatial samples used according to the
16 invention?

17 A. They are used to decode spatial information.

18 Q. And how is this reflected in the claims?

19 A. The wording of the claim says that we need to
20 decode by a processor the plurality of spatial samples into
21 the decoded spatial information.

22 On the right is the decoded spatial information
23 which is the form of the spatial component of this
24 representation, which is of a size block and that is
25 suitable for adding to the transform information and the

1 prediction in order to create the decoded block.

2 Q. Okay. And what's the significance of the fact
3 that spatial information is a block size?

4 A. Just the fact that it's suitable for adding
5 together to other block units.

6 Q. What does the decoder in Koga receive?

7 A. Koga receives the block of spatial samples, which
8 is spatial information. And because of that, it does not
9 practice the step on the bottom. It never decodes. It
10 never needs to decode because it never sends an individual
11 spatial sample. It sends only a block of spatial samples,
12 so it never decodes spatial samples into spatial decoded
13 spatial information.

14 Q. Now, Dr. Storer pointed to dequantization for
15 decoding spatial samples in Koga. Does Koga disclose
16 dequantizing spatial samples?

17 A. No, it does not.

18 Q. Let's look at Koga. And if we could pull up
19 RX-4614 and go to 3, 59 to 66, please.

20 What was Koga trying to solve?

21 A. Well, to understand Koga you need to recognize
22 the period it came from. Koga was originally, has a
23 priority date of 1985 which is before any of the standards
24 we have talked about in this case ever existed. In fact,
25 the very earliest standard which would be H.261 didn't even

1 exist at that time but it was in the planning stage.

2 And at that point, Koga had already submitted to
3 the group developing H.261 a proposal that coded prediction
4 error purely spatially, the entire prediction error
5 spatially. And other groups had proposed to Koga purely
6 with transforms.

7 And he proposed this patent to provide a way to
8 avoid what he says here, he identifies the problem as that
9 the picture image quality changes abruptly when changing to
10 a mode wherein orthogonal transformation is not used and
11 vice versa. As a consequence, this technique has not proved
12 successful.

13 So he notes that when you just switch from one to
14 the other, which he envisioned would be what he would like
15 people to do, that you would end up with an abrupt change at
16 the point of switching. So this whole patent is what we
17 call the Koga patent is for the purpose of an allowing a
18 graduate switch to have an intermediate thing where you use
19 partial transform and partial spatial.

20 Q. So is Koga at all interested in trying to
21 individually address outliers?

22 A. Absolutely not. In fact, the whole purpose of
23 this --

24 MR. MILLIKAN: Objection, Your Honor. This is
25 beyond the scope of his report.

1 JUDGE ELLIOT: Hold on.

2 MR. MILLIKAN: I can clarify, Your Honor.

3 JUDGE ELLIOT: All right. Mr. Lipschitz, show me
4 where he talks about this.

5 MR. LIPSCHITZ: Yes, Your Honor. In the rebuttal
6 report, paragraph 50, he explains what the purpose of Koga
7 is. And it is not to individually address outliers.

8 Can we please pull that up?

9 JUDGE ELLIOT: Give me a moment.

10 So show me somewhere where he talks about
11 individually addressing outliers?

12 MR. LIPSCHITZ: What he is explaining here, Your
13 Honor, is that the Koga is intended to address the situation
14 when you're transitioning from spatial samples to transform
15 information. So there's nothing in there about outliers.
16 He doesn't specifically say here it's not about outliers but
17 here he is explaining what it is about, and it's not about
18 outliers.

19 JUDGE ELLIOT: Okay. I will sustain the
20 objection but I think you might be able to rephrase this in
21 a way that would be within the scope of the paragraph.

22 MR. LIPSCHITZ: Okay.

23 BY MR. LIPSCHITZ:

24 Q. Let's pull up RDX-97C.42, please.

25 What are we looking at here, sir?

1 A. We're looking at I think a slide from
2 Dr. Storer's presentation drawn from photo 3 -- Figure 3 of
3 Koga.

4 Q. And what does he identify as the prediction error
5 signal?

6 A. It's up on the left side there, the yellow block.

7 Q. Where does he say that signal is sent?

8 A. It goes two places. One to block 13, which is
9 the transform and the other to delay circuit 16 into the
10 subtractor 19.

11 Q. According to Dr. Storer, where are the plurality
12 of spatial samples created?

13 A. They are created by doing the subtraction of 19
14 and --

15 Q. Where are the spatial samples sent from the
16 subtractor 19?

17 A. They are sent to the quantizer 17.

18 Q. What do quantizers output?

19 A. Quantizer, it depends on the context. Quantizers
20 can output symbols that represent the pixel value or they
21 can output the quantized pixel value itself.

22 Q. And what is the output of the quantizer 17
23 disclosed in Koga?

24 A. Well, Koga is a block diagram, it makes it very
25 clear that this quantizer outputs the quantized value

1 itself.

2 Q. And are those pixel values?

3 A. Those are pixel values. And the reason we know
4 they are pixel values is because, besides being coded it
5 also is sent right -- it is obscured by the notation of
6 Koga's -- Storer's slide here, but if you took away the
7 green, you would see that that output of 17 also goes down
8 to an adder. It makes no sense to add symbols to values of
9 pixels from other sources. It has to be pixel values that
10 are being added.

11 Q. And where else are these pixels sent besides that
12 adder?

13 A. They are sent to the code converter on the right,
14 which then turns it into an entropy encodes and turns it
15 into bits which is 3,000.

16 Q. That's the orange that we see on the far
17 right-hand side there?

18 A. That's right. The orange represents the bits
19 created from entropy coding those values.

20 Q. Let's pull up RDX-97C.47. And what is received
21 at the decoder on the right side?

22 A. Exactly the same thing, 3000. So those are the
23 bits that were created by the encoder.

24 Q. And is that the orange line that was output by
25 the encoder that you just showed us?

1 A. That's right. On the other thought, that would
2 have been the orange line. So this probably would be best
3 colored in orange.

4 Q. Now, Dr. Storer shows that the green spatial
5 samples are output by the demultiplexer. Do you agree with
6 that?

7 A. I disagree with that.

8 Q. Why?

9 A. Because demultiplexers do nothing more than
10 separate the input source, distribute the input source to
11 different destinations or portions of the input source.
12 Since the input source are bits, the things it sends to the
13 different destination are all bits. So where it is shown in
14 green, it should recognize those are bits, not plurality of
15 spatial samples.

16 Q. So what color should that be, that part in green
17 there?

18 A. That should be orange also.

19 Q. Now, do these bits entering 501 represent spatial
20 samples or a full block of spatial information?

21 A. Well, the disclosure immediately below there says
22 the decoder 501 decodes correctly an incoming block signal.
23 So presumably the bits that come in are grouped to represent
24 a block of spatial samples.

25 Q. Dr. Storer says that the decoding that occurs

1 here to satisfy the claim element is dequantization. Do you
2 agree that is disclosed here?

3 A. There is no dequantization disclosed anywhere in
4 Koga.

5 Q. How do you know that?

6 A. It doesn't mention it. Another reason is because
7 dequantization is only something that is applied to symbols
8 to make -- to turn the symbols back into the pixel values
9 and we saw in the earlier case that what he pointed to as
10 plurality of spatial samples are already pixel values so
11 there would -- not only does Koga not discuss any
12 dequantization, one would understand there is no role of
13 dequantization in this architecture.

14 Q. But it says below that quantization
15 characteristics are used. Doesn't that mean there is
16 quantization?

17 A. No, because quantization characteristics are also
18 needed to do the entropy decoding in order that it can
19 output the right values on the output of the 501.

20 Q. What is the output of 501?

21 A. It would be the plurality of spatial samples. I
22 think a person of ordinary skill in the art would understand
23 that an entropy encoder and an entropy decoder pair together
24 to create loss or to provide lossless coding. I think
25 Dr. Storer also made that, emphasized that point.

1 So what we can know is the output of 501 is
2 exactly what went into the code converter on the other
3 picture, which -- it would be a lossless rendition of that.
4 And on that plot it was identified as the plurality of
5 spatial samples and it was colored in green. So that's what
6 would come out of 501.

7 Q. So what are the inputs and the outputs to the
8 decoding block 501?

9 A. The inputs are bits. The outputs are a whole
10 block full of spatial samples which would qualify as spatial
11 information.

12 Q. So does Koga disclose decoding of spatial samples
13 into spatial information?

14 A. It only has one collection of spatial samples
15 which already are spatial information, so no, there is no
16 decoding.

17 Q. Okay. Let's go back to the slides, please.

18 Turning to claims 29 and 38 and looking at your
19 diagram again, can you remind us how these claims relate to
20 your diagram?

21 A. This is to illustrate the situation that these
22 dependent claims address, we look at a situation, where on
23 the right the spatial information has multiple 21s in it.
24 And so because of that, the spatial samples on the left
25 would have multiple 21, if we were not practicing claim 29,

1 but because we're instructed to -- wherein at least some of
2 the plurality of spatial samples are decoded as a single
3 unit, you will note there is only one 21 there. That is the
4 single unit that represents the three 21s.

5 Q. And did Dr. Storer even contend that a single
6 spatial sample can be decoded and used in multiple pixel
7 locations as you have depicted here?

8 A. In Koga, no, he never made that claim.

9 Q. Let's go to JX-10 at 6, 37 to 41. What does the
10 '991 say about what we're grouping together when we decode
11 multiple spatial samples as a unit?

12 A. Well, first, it describes that the number of
13 spatial samples can be coded and decoded as one unit. And
14 it offers as examples of this that this could be used to
15 represent certain patterns and textures. And I guess the
16 noteworthy part of this that a person of ordinary skill in
17 the art would pay attention to is that this is a suggestion
18 to decode the spatial samples as a unit, so that would be
19 already the group, the outliers that are together.

20 But it says that the grouping of them as a unit
21 is based on patterns or textures. And the thing that would
22 be noteworthy there is that the grouping is based on what's
23 in those values. So we would look at those spatial samples
24 and it's the -- because of the commonality or whatever
25 commonality that is related to patterns or textures, that's

1 what would lead us to this act of decoding them as a unit.

2 Q. Let's pull up RDX-97C.51.

3 Here is Dr. Storer's only slide on these
4 dependent claims. Now, does this excerpt have any
5 relationship to the decoder?

6 A. It is unrelated to anything at the decoder.

7 Q. Does this excerpt have any relationship to
8 spatial samples or the creation of spatial samples?

9 A. It is unrelated to anything to do with spatial
10 samples.

11 Q. And does this excerpt have any relation to coding
12 multiple spatial samples as a unit?

13 A. It has no relation to coding multiple spatial
14 samples as a unit.

15 Q. Okay. What does this relate to?

16 A. It relates to the fact that the transform that is
17 applied is one that is a block transform and therefore is
18 applied block by block.

19 Q. Did you hear Dr. Storer's testimony that it was
20 known to code multiple spatial samples as a unit into bits?

21 A. I did.

22 Q. And do you believe that satisfies this claim
23 element?

24 A. I believe it is pretty much unrelated to this
25 claim element.

1 Q. Okay. Why is that?

2 A. First, the statement that he made is related to
3 coding variables into bits and so this is decoding. I
4 suppose if you grant him that he meant to look at that from
5 the decoding viewpoint, the decoding he would be talking
6 about would be the decoding of bits into spatial samples.

7 This element has to do with the decoding of
8 spatial samples into spatial information. So it's a
9 different coding he is pointing to. And, secondly, the
10 grouping that he talked of I am very much familiar with what
11 he was referring to and it's a group that is unrelated to
12 the contents of -- you can group variables together, but the
13 grouping is done before you ever look at what's in there.
14 In fact, it is designed so as to be able to accommodate any
15 content in those. So it's not a grouping that -- into a
16 unit that is meant to reflect patterns or textures or
17 anything that is talked about in the '991.

18 Q. Did Dr. Storer explain why this excerpt here
19 would motivate a person of skill in the art to code multiple
20 spatial samples at once?

21 A. No, he didn't.

22 Q. Do you think it would be obvious to do so?

23 A. No, I do not.

24 Q. Okay. Now, is the '991 -- let's go to the next
25 slide, please.

1 Is the '991 patent directed to the abstract idea
2 of just performing a mathematical operation?

3 A. No, it's not.

4 Q. Does it provide a technical solution to a
5 technical problem?

6 A. Absolutely.

7 Q. What was it?

8 A. It's the problem of improving the efficiency of
9 transform coding when addressing prediction error that has
10 outliers. And its solution is to separate the two in order
11 to get more efficient coding of the prediction error.

12 Q. Thank you.

13 MR. LIPSCHITZ: Pass the witness, Your Honor.

14 MR. MILLIKAN: May I proceed, Your Honor?

15 JUDGE ELLIOT: Yes.

16 CROSS-EXAMINATION

17 BY MR. MILLIKAN:

18 Q. Good morning, Dr. Orchard.

19 A. Good morning.

20 Q. You talked at length about outliers, right?

21 A. Yes, I did.

22 Q. The word outlier doesn't exist in any of the
23 asserted claims, right?

24 A. That is true. Yes.

25 Q. And the word outlier only exists in the encoder

1 claims that are not asserted, right?

2 A. I believe that's true, yes.

3 Q. Let's focus on the spatial decoding step. You
4 would agree that the decoding step, the spatial decoding
5 step does not require a particular way of converting spatial
6 samples into spatial information, correct?

7 A. I believe that a person of ordinary skill in the
8 art would understand it to be a step that provides the
9 function that is described in the specification, in the
10 invention.

11 Q. Is that a no to my question, Doctor?

12 A. I suppose there are various ways you can achieve
13 the goals of the specification, so I guess not -- I would
14 say no, it does not require that one of those be used.

15 Q. Okay. It does not require a particular way,
16 correct?

17 A. It does not require any one way to achieve the
18 goals of the specification, or the attention of the
19 specification.

20 Q. You added some words there at the end. So I'm
21 going to ask you one more time. Do the claims of the '991
22 patent require a particular way of converting spatial
23 samples to spatial information?

24 A. I'd like my answer to be understood for the
25 intention that I mean it to be. And so I would like to be

1 specific that it requires a way -- it does not require one
2 way but any way that achieves the goals of the specification
3 or the objective of the specification.

4 Q. The spatial decoding step covers prior art ways
5 of converting spatial samples into spatial information,
6 correct?

7 A. Yes, I suppose so, yes.

8 Q. Let's look at what the '991 has to say on the
9 spatial decoding step and things that qualify as the spatial
10 decoding step.

11 A. Okay.

12 Q. Can you pull up slide number 5.

13 Shown here on RDX-0097C.5 are five or four
14 dependent claims. Do you see that?

15 A. I do.

16 Q. They all have similar language but I am going to
17 read from claim 25. "The method of claim 22, wherein the
18 decoding of the plurality of transform coefficients and
19 spatial samples includes dequantization of each, and wherein
20 the dequantization of transformed coefficients and spatial
21 samples are related to each other."

22 Did I read that correctly?

23 A. Yes, you did.

24 Q. So we can agree that dequantization is one way to
25 perform the spatial decoding step, right?

1 A. I believe that these are noting the entirety of
2 what you read and so it's specifying that the type of
3 dequantization, when dequantization is included, in other
4 words, that they are the same or one of them says that they
5 are different.

6 Q. It specifies a way of dequantization, right, in
7 this claim?

8 A. It specifies -- it entertains the possibility
9 that dequantization could be included and in those cases
10 that the dequantization has the characteristics that are
11 shown in the second half of that you have not highlighted.
12 That's what is being claimed here.

13 Q. Doctor, I understand the claim is narrower. I
14 want to be clear that because of this dependent claim, the
15 independents are broad enough to cover dequantization,
16 right?

17 A. When dequantization is included in an
18 implementation, yes, I would -- I would say that.

19 Q. Okay. Let's turn to what Koga shows and let's
20 start with your slide Number 6. Next slide, please.

21 This is a diagram -- this is your diagram, right,
22 of what Koga supposedly shows?

23 A. Yes, it is.

24 Q. On the left-hand side you show Koga has a coded
25 prediction error signal, right?

1 A. That's true.

2 Q. And that signal has spatial samples in it,
3 correct?

4 A. It's a representation of spatial samples, of
5 spatial information, actually.

6 Q. It has transform coefficients in it too, right?

7 A. Yes, it does. It's a representation of transform
8 coefficients.

9 Q. In Koga, the coded prediction error has spatial
10 samples, right?

11 A. It -- I'm sorry. Repeat the question?

12 Q. In Koga, the coded prediction error signal has
13 spatial samples, right?

14 A. Has bits that represent spatial samples, yes, an
15 entire block of spatial samples.

16 Q. That's a yes to my question, right, Doctor?

17 A. I just want to be clear that the coded prediction
18 error signal are bits in Koga and they contain
19 representation of an entire block of spatial samples.

20 Q. You're not contesting element A of claim 22,
21 right, that says receiving a coded prediction error signal,
22 the coded prediction error signal including a plurality of
23 transform coefficients and a plurality of spatial samples,"
24 right?

25 A. I attempted in my first slide to be very clear

1 that I was only contesting 22c, I think I referred to it.

2 Q. So that's a yes to my question, again, Doctor?

3 You're not contesting A, right?

4 A. I am not contesting 22a.

5 Q. All right. So you agree Koga has the required
6 spatial samples of claim 22, element A, right?

7 A. It -- the bitstream represents the spatial
8 samples of 22, referred to in 22c, yeah.

9 Q. Is that a yes?

10 A. I'm trying my best to understand your question
11 and making sure that I give a clear statement of my answer
12 to your question.

13 Q. Okay. You show on this slide that the coded
14 prediction error signal is processed by entropy decoder in
15 Koga, right?

16 A. Well, here I -- yes, this was from my general
17 slide so in general it is entropy decoded but yes, in Koga
18 it is also entropy decoded.

19 Q. You show the output of the entropy decoder as
20 spatial information, correct?

21 A. I do so that, yes.

22 Q. By your own diagram Koga has -- receives the
23 coded -- receives a coded prediction error signal with
24 spatial samples and it entropy decodes an output spatial
25 information, right?

1 A. Yes, I agree.

2 Q. Okay. You show no additional decoder for that
3 bottom line, right?

4 A. There is no step in Koga or needed in Koga in
5 decoding a collection of spatial samples into spatial
6 information. What is received is spatial information.

7 Q. I'm just drawing attention to there is an entropy
8 decoder that receives spatial samples and produces spatial
9 information but there is no extra decoder, right?

10 A. There is an entropy decoder that receives bits
11 and that puts out spatial information.

12 Q. Okay. If I pull up the slide that shows the
13 '991, you have an extra decoder box in the bottom line,
14 right?

15 A. That's because in the anticipated invention of
16 the '991, there is a need to decode from the spatial samples
17 that are entropy decoded from the bits on to a block full of
18 spatial samples.

19 Q. Doctor, I didn't ask why. I asked if on the '991
20 slide you have another box at the bottom line that says
21 decode. That was the question.

22 A. Yes, there is another block that is needed in the
23 '991 invention.

24 Q. Let's look at Koga's figures. Let's pull up
25 slide Number 7.

1 You talked about this on direct. Dr. Storer says
2 decoder 501 is the decoder that receives spatial samples,
3 right?

4 A. Yes, he does.

5 Q. And in decoder 501, we see the excerpt here that
6 says the decoder 501 correctly -- decodes correctly an
7 incoming block signal, right?

8 A. That's true.

9 Q. It receives a block signal, right?

10 A. It receives bits that represent a block, yeah.

11 Q. And the claim just says decoding spatial samples
12 to spatial information, right? That's what the claim
13 requires, right?

14 A. That's right.

15 Q. But that decoder, just that 501 decoder, can't be
16 that decoder, that's your testimony, right?

17 A. Because it is not decoding spatial samples. It
18 is decoding bits.

19 Q. And we saw before that the claims are broad
20 enough to cover dequantization as a form of that decoding,
21 right?

22 A. If the spatial samples are represented as symbols
23 then dequantization would be needed and that would be
24 covered as we saw. In this case, not only are they not
25 symbols they are not even symbols, they are not values, they

1 are bits to this decoder 501. So this 501 plays the role of
2 the entropy decoder in the earlier diagram.

3 Q. Doctor, a person of ordinary skill would know how
4 to take spatial samples and make symbols and take symbols
5 and make spatial samples, right?

6 A. A person of ordinary skill in the art would
7 recognize if something was a symbol and would know how to
8 make -- turn symbols into values. And it would also
9 recognize that Koga does not have any symbols shown anywhere
10 in the block diagram.

11 Q. You understand our theory is obviousness, right?
12 Not strictly anticipation, right?

13 A. For this particular claim, I just understand what
14 Dr. Storer said and I am just making -- I am sort of
15 analyzing the structure and the processing in relationship
16 to --

17 Q. But you understand it is under an obviousness
18 rubric, right, not anticipation? Right?

19 A. I mean, I have a hint, but my analysis is
20 intended to give an expert opinion of what a person of
21 ordinary skill in the art would understand is happening,
22 both in Koga, both in '991 and draw conclusions about those.

23 Q. Is that a yes or a no to my question?

24 A. I don't understand exactly what your objectives
25 are, no.

1 Q. Okay. So it's an "I don't know" is the answer to
2 my question, right?

3 A. If your question is about my understanding of
4 your objectives, yes, it's an "I don't know."

5 Q. Let's go back to the text on the screen. The
6 excerpt on the right says the decoder, a 501 decodes
7 correctly an incoming block signal if, A, the quantization
8 characteristic signal from the decoder 503 is correctly
9 decoded in connection with the incoming block signal and if,
10 B, the difference between the prediction error signal and
11 the inverse orthogonal transformation is to be decoded.

12 Did I read that correctly?

13 A. Yes.

14 Q. So 501 gets two signals. It gets a block signal,
15 right, and it gets a quantization characteristic signal,
16 right?

17 A. That's true.

18 Q. And it is your -- a person of ordinary skill
19 would understand that quantization characteristic signal can
20 be for dequantizing, right?

21 A. If there were dequantization going on, certainly
22 it would need quantization characteristics for doing that
23 but it's also used for entropy decoding as shown in 501.

24 Q. You needed to say dequantization instead of
25 quantization characteristics; is that right?

1 A. In my answer just now? I think I said
2 quantization characteristics. I can repeat. I believe that
3 a person of ordinary skill in the art would understand that
4 quantization characteristic signals are needed if one were
5 to perform dequantization but is also needed in this case in
6 order that 501 entropy decoding can be done correctly and
7 can output the correct pixel values.

8 Q. I just want to be clear on your testimony. The
9 excerpt is clear that 501, the decoder Dr. Storer points to,
10 receives the quantization characteristic signal, right, and
11 the claims also are broad enough to cover dequantization,
12 right? Those two things are both true, right?

13 A. Maybe we can treat them separately. They are
14 unrelated to -- the two statements I believe you made are
15 unrelated, but it is true that 501 has a line coming in on
16 the bottom and that line does carry the quantization
17 characteristic signals.

18 And completely separate from Koga, since Koga
19 never mentions dequantization and makes it obvious that no
20 dequantization is ever done in Koga. It is also true that
21 dequantization would need quantization characteristics to be
22 performed.

23 Q. If we look to the left of decoder 501, we see
24 adder 54. Do you see that?

25 A. Yes.

1 Q. Koga teaches adding the inverse transform
2 prediction error to the pixel values of prediction error,
3 right?

4 A. To the pixel values on prediction errors? Is
5 that what you said?

6 Q. The pixel values of prediction error.

7 A. I am not sure. You said -- can you repeat that
8 again? I honestly can't parse.

9 Q. Koga teaches adding the inverse transform
10 prediction error to the pixel values of prediction error,
11 right?

12 A. I think that what it teaches to add are the three
13 things that are going into those adder and the one that you
14 -- the first item you mentioned is what is coming from 51.
15 And I agree that that is what's being added but neither of
16 the other two meet, at least I understand to be what you
17 say, the second thing.

18 So since it's only adding those three things
19 together, I guess I would have to say no. If you --

20 Q. Let's pull up --

21 A. If you could be clear what the second thing
22 you're saying it's added to, I could -- I could answer.

23 Q. Please pull up Orchard deposition transcript at
24 column 132, lines 5 through 8.

25 "Koga teaches adding" starting on line 5 at the

1 top. "Koga teaches adding the inverse transform prediction
2 error to the pixel values of prediction error, right?

3 "Answer: Yes, it does."

4 Did I read that correctly?

5 A. You did read that correctly.

6 Q. Okay. If we go back to the figure, you would
7 agree that the sum of the outputs of 51 and 52 which feed
8 into the adder is a prediction error signal, correct?

9 A. Yes. The sum of them would be a prediction error
10 signal.

11 Q. And the output of the adder is a reconstructed
12 picture, right?

13 A. The output of the adder is a reconstructed
14 picture, yes.

15 Q. Doctor, you have testified that at the
16 demultiplexer 3000 Koga gets the right signal and at the
17 output -- at the inputs to adder 54 and the output to adder
18 54, Koga has the right outputs, but your testimony today is
19 somewhere between it doesn't do the middle processing right,
20 right?

21 A. I believe what you are describing was clear from
22 my diagram, yes. It takes in the right input on the left.
23 It does produce a decoded result that is the sum of spatial
24 information and transform information, but it is missing one
25 of the steps that is associated with 22c.

1 Q. Right. But earlier you also testified that the
2 claims don't require a particular way of converting spatial
3 samples to spatial information, correct?

4 A. It does not require a particular way to perform
5 the decoding of spatial samples into spatial information to
6 reflect what a person of ordinary skill in the art would
7 understand as the teachings of the '991 patent, but it does
8 require some way that does perform decoding of spatial
9 samples into spatial information.

10 Q. Doctor, I just want to be really clear, the
11 inputs and the outputs are correct and the claim doesn't
12 require a particular way, right? Both those things are
13 true?

14 A. It does require a way that meets a characteristic
15 that reflects the teachings of the '991 patent, not any one
16 particular way among those ways, but, no, it's not true that
17 anything that it does would meet the claim element.

18 Q. Let's pull up Orchard deposition transcript 118,
19 at 12 through 21.

20 "Do the claims of the" --

21 "Question: Do the claims of the '991 require a
22 particular way of converting spatial samples to spatial
23 information?

24 "Answer: No, they do not."

25 Did I read that correctly?

1 A. In this context, I mean, I think I would agree
2 with that in a proper context, I just answered your question
3 now more specifically.

4 Q. Doctor?

5 A. Yes.

6 Q. Did I read that correctly?

7 A. I would agree -- yes, you did. And I would agree
8 with that, given the context that that was answered, that
9 question was answered in.

10 Q. Okay. Let's turn to the dependent claims.

11 You understand claim 29 depends from 22 and 38
12 from 31, right?

13 Do you want me to pull them up? Can you pull up
14 slide number 1.

15 A. I didn't hear your question.

16 Q. Okay. You understand claim 29 depends from 22
17 and claim 38 depends from 31. Right?

18 A. Yes, yes, I'm sorry.

19 Q. And the claims just say that at least some of the
20 plurality of spatial samples are decoded as a single unit,
21 right?

22 A. That's what it says, yes.

23 Q. By 2007, there were lots of ways a person of
24 ordinary skill in the art knew how to code some pixel values
25 as a unit, right?

1 A. Yes. I mean, I would -- I would clarify that the
2 decoding of the unit is reflecting the teachings of the '991
3 but, yes, there are several ways that one could do that,
4 yes.

5 Q. A person of ordinary skill knew how to do this
6 step, right, before the '991 patent, right?

7 A. Yes.

8 Q. And some of those ways are averaging the samples,
9 right?

10 A. Again, this is not saying to code them as a unit
11 just no regard to what they are. First, they are coding
12 spatial samples and so the spatial samples are samples that
13 have been identified as the list of spatial samples. And
14 they are reflecting the pattern or texture or something
15 about them. So just averaging two values that you know
16 nothing about, I don't think I would agree would meet that.

17 Q. Let's pull up the Orchard deposition transcript
18 219, line 5.

19 This is even a year earlier on column 5, just on
20 the left, please.

21 "Question: In 2006, did a person of ordinary
22 skill know of any ways to code pixel values together as a
23 unit?

24 "Answer: Outside of the column that you're
25 describing a function outside the context of the '991 and

1 that really does not have the richness of the teachings of
2 that sentence in this context that, yes, people knew how to
3 code two values together."

4 Did I read that correctly?

5 A. Yes. And I would agree with that.

6 Q. Okay. The next question says "Give me some
7 examples."

8 "Answer: Coding the average of two values would
9 be a way of coding two values together."

10 Did I read that correctly?

11 A. That's true.

12 Q. Okay. You can take that down.

13 You could code the median of two values too,
14 right?

15 A. That would be the way to code two arbitrary
16 values together, yes.

17 Q. You could run-link code them as well?

18 A. That would be a way to code arbitrary values
19 together, that's true.

20 Q. You could use a code book too, right?

21 A. Yes.

22 Q. Okay. And Huffman is an example of a code book,
23 right?

24 A. Huffman coding is an example of a code book used
25 to code generally in the original paper that Storer

1 referenced a single value, but yes.

2 Q. It was commonly understood in video coding to use
3 Huffman codes and create code books, right?

4 A. Yes.

5 Q. If I pulled up MPEG-1 Appendix A it would show a
6 code book table, right?

7 A. Yes, it would.

8 Q. And Koga says to use Huffman codes for example,
9 right?

10 A. Koga does refer to coding various things with
11 Huffman codes, yes.

12 Q. Okay.

13 MR. MILLIKAN: No further questions.

14 JUDGE ELLIOT: Ms. Ducca, anything?

15 MS. DUCCA: No questions from Staff.

16 JUDGE ELLIOT: Very well. Mr. Lipschitz?

17 MR. LIPSCHITZ: Very briefly, Your Honor.

18 REDIRECT EXAMINATION

19 BY MR. LIPSCHITZ:

20 Q. Did counsel show you anywhere where Koga
21 discusses or discloses dequantization?

22 A. No.

23 Q. Do you believe the asserted claims are obvious
24 over Koga?

25 A. No.

1 MR. LIPSCHITZ: No further questions, Your Honor.

2 JUDGE ELLIOT: Very well. Thank you, sir.

3 THE WITNESS: Thank you.

4 (The witness stood down.)

5 JUDGE ELLIOT: All right. So we're done? No?

6 We have one more? Who is next? Dr. Kia, come on up.

7 MR. MILLER: Your Honor, there is one objection
8 to resolve regarding Dr. Kia's slides. I am happy to raise
9 that now.

10 JUDGE ELLIOT: I will remind you, you are still
11 under oath.

12 MR. MILLER: Zach Miller, Your Honor, on behalf
13 of Respondents. The slide that the Respondents object to,
14 Your Honor, there is two slides, CDX-14C.18 and 14C.19. Can
15 you pull up 14C.18?

16 The objection, Your Honor, is that Dr. Kia is
17 presenting arguments regarding element limitations 8e and
18 10e of the '321 patent on behalf of Kim and those arguments
19 have been withdrawn or abandoned by Complainants because
20 they were not included in Complainants' pretrial brief.

21 As you know ground rule 9.2 says any contentions
22 not set forth in detail in the pretrial brief shall be
23 deemed abandoned or withdrawn. And Complainants haven't set
24 forth any argument related to limitations 8e and 10e in
25 detail as required.

1 If we pull up the prehearing brief at page 79,
2 Complainants' prehearing brief at page 79 -- sorry, 79 of
3 the document, not of the PDF.

4 Thank you. This is where Complainants start
5 their argument regarding Kim, Your Honor. If you look at
6 the bottom of this introductory section, keep going down,
7 right here, the last sentence where they say -- this is the
8 only part where they talk about the resetting limitation,
9 which is referred to as limitation D in the brief but is
10 limitation E on the slides. It is the same limitation.

11 He says -- the brief says "Dr. Kia will testify
12 that Kim fails to disclose resetting an identifier value
13 according to limitation D of the asserted claims because the
14 decoder Dr. Saber identified does not reset any indication
15 value whatsoever."

16 That is the entirety of the disclosure in the
17 prehearing brief regarding element -- this resetting
18 element, Your Honor. There is no explanation of what they
19 are going to argue, other than there's no resetting in Kim
20 without any explanation whatsoever. We don't believe that
21 that is sufficient detail to allow them to raise arguments
22 regarding what resetting is by Dr. Kia.

23 JUDGE ELLIOT: All right. Could you show me page
24 80 of the expert report, please.

25 MR. MILLER: Page 80 of --

1 JUDGE ELLIOT: The next page.

2 MR. MILLER: Oh, the next page. Sorry. This is
3 the pretrial brief, Your Honor, not the expert report.

4 JUDGE ELLIOT: I'm sorry. I beg your pardon.
5 You're right.

6 MR. MILLER: Yes.

7 JUDGE ELLIOT: Next page? Okay. All right.

8 Can you go back and show me slide 18 again and
9 then show me slide 19, please.

10 MR. MILLER: Can you bring up slide 18?

11 JUDGE ELLIOT: Okay. Next slide.

12 MR. MILLER: Slide 19 is just the last row, Your
13 Honor, that we're disputing.

14 JUDGE ELLIOT: I see. Okay, thank you, Mr.
15 Miller.

16 MR. FRIST: So, Your Honor, I know you just saw
17 the prehearing brief and I will just read it to you. The
18 sentence in the prehearing brief says that Kim fails to
19 disclose resetting an identifier value according to
20 limitation D, which you heard is actually limitation E in
21 those slides, because the decoder Dr. Saber identified does
22 not reset any indication value whatsoever. And that is --

23 JUDGE ELLIOT: Okay, hold on. So is the issue
24 here that you have a difference in how you have identified
25 the elements?

1 MR. FRIST: So to be honest, I am not sure. I
2 think they are saying it is not that issue, but I think they
3 are saying that the sufficiency of the explanation is not
4 detailed enough. But the statement is clear that it is
5 Complainants' position and Dr. Kia will testify that what
6 Dr. Saber pointed to for limitation E is not to the decoder,
7 it is to the encoder.

8 And so a decoder does not reset any indication
9 value whatsoever. That is precisely what Dr. Kia discussed
10 if you look at paragraphs 113 through 116 of his expert
11 report which I can show you.

12 But Dr. Kia is just going to take the stand and
13 say just that, that what Dr. Saber pointed to is an encoder,
14 an encoder functionality, the claim is decoder, decoder
15 functionality.

16 And that is exactly what that sentence says.
17 And, Your Honor, if we can bring up the expert report of
18 Dr. Kia and go to paragraph 114, please, and 15.

19 So if you look -- sorry, pull that down, the
20 rebuttal report, please.

21 JUDGE ELLIOT: I don't need any more. I think
22 there must be a typo in your prehearing brief.

23 MR. FRIST: That's correct. Limitation D that we
24 referred to in the prehearing brief, everybody understands
25 should be limitation E.

1 JUDGE ELLIOT: Okay.

2 MR. FRIST: It is the same --

3 JUDGE ELLIOT: Overruled.

4 Whereupon--

5 OMID KIA,

6 having been previously duly sworn/affirmed, was examined and
7 testified as follows:

8 MR. FRIST: May I proceed, Your Honor?

9 JUDGE ELLIOT: Yes.

10 DIRECT EXAMINATION

11 BY MR. FRIST:

12 Q. Dr. Kia, were you in the courtroom when
13 Dr. Storer and Dr. Saber gave their opinions regarding
14 validity of the '818 and '321 patents?

15 A. Yes, I was.

16 Q. Do you agree with their conclusions?

17 A. No, I do not.

18 Q. All right. Let's start with the '818 patent. Do
19 you understand that Respondents have argued that the
20 asserted claims are obvious in light of VCEG-N52 and Sriram?

21 A. Yes, that is my understanding.

22 Q. What does VCEG and VCEG-N52 stand for?

23 A. VCEG is the Video Coding Experts Group. And N52
24 is just a numbering scheme to keep track of submissions.

25 Q. Why is the Video Coding Expert Group referred to

1 as experts?

2 A. Well, that's because they consist of experts.

3 Q. What types of companies have representatives that
4 participate in this Video Coding Expert Group?

5 A. The companies are leading companies that have a
6 vested interest in how the standard develops so that their
7 products that they develop would work with the standards and
8 would be used with the consumers.

9 Q. Do universities and other research institutions
10 send representatives to participate in this Video Coding
11 Experts Group?

12 A. Yes, sir, they do.

13 Q. And how long have the members of this Video
14 Coding Expert Group been working together?

15 A. That would be decades.

16 Q. And can you give us some examples of standards
17 that this Video Coding Expert Group has developed?

18 A. Yeah. Some examples are H.265, H.264, H.262.
19 There is others.

20 Q. Would you consider this group of individuals to
21 be a group of individuals with ordinary skill or
22 extraordinary skill?

23 A. I would consider them to have extraordinary skill
24 in the art.

25 Q. Can you describe how this group generally

1 develops a standard?

2 A. Sure. The group starts a process and at a point
3 where technology is inserted, the members would submit
4 proposals. It would be presented. It would be argued. The
5 body would vote on it and based on the merits of the
6 proposal, it would be either accepted into the -- adopted
7 into the standard or rejected.

8 Q. How many years does it take typically to develop
9 a video coding standard?

10 A. Multiple years.

11 Q. Okay. And does the Video Coding Expert Group
12 have regular meetings to discuss these proposals?

13 A. Yes, they do.

14 Q. How many times a year do they meet?

15 A. Somewhere between four and six, around there.

16 Q. Okay. Focusing on VCEG-N52, was VCEG-N52
17 presented at one of these meetings of the video coding
18 experts?

19 A. Yes, sir, it was.

20 Q. And how many total attendees would have been at
21 that meeting?

22 A. That would be hundreds of attendees.

23 Q. Now, if we look at the disclosure of VCEG-N52 on
24 slide 2, do you see where it says in this framework, all
25 information that was traditionally conveyed in sequences,

1 group of picture or picture headers is conveyed out of band?

2 A. I do see that.

3 Q. And prior to VCEG-N52, how were parameters
4 traditionally conveyed in a bitstream?

5 A. Prior to VCEG-N52, parameters are conveyed in
6 headers.

7 Q. How long had headers been used in video coding
8 prior to VCEG-N52?

9 A. Yeah, headers has been around for a long time,
10 since the video coding standard started.

11 Q. Can you provide any examples of major video
12 Codecs that used headers prior to VCEG-N52?

13 A. Sure. H.262 is an example, uses headers.

14 Q. And what did VCEG-N52 propose to replace the
15 headers?

16 A. Proposed to place the parameters in a parameter
17 set, instead of headers.

18 Q. What does this disclosure of VCEG-N52 mean when
19 it says parameter sets can be conveyed out of band?

20 A. What it means is that VCEG-N52 proposed to
21 aggregate the parameters, put them in a parameter set and
22 send them in a channel that is different than the channel
23 that would be used to send the image data.

24 Q. What is the benefit of out of band signaling of
25 parameter sets?

1 A. So there's a few. In lossy environments, they
2 envision that the parameter set, which is susceptible to
3 loss if you lose some parameters, it is very bad, is to send
4 the parameter set in a more reliable channel and to leave
5 the heavy lifting, a lot of the data in the image data to
6 the band that is more lossy.

7 Q. Now, focusing on VCEG's signal parameter
8 structure design, what was the benefit of that over using
9 headers?

10 A. Well, you don't have to constantly send
11 parameters. The headers were always sent. It was
12 regimented. So the parameter set envisioned by VCEG-N52
13 would only be transmitted when needed.

14 Q. Do you see the first bullet point on this callout
15 from VCEG-N52 where it says the results of the capability
16 exchange can be used directly for establishing knowledge of
17 the parameters, thus making nor transmissions (for example,
18 a picture headers) unnecessary? Do you see that?

19 A. I do see that.

20 Q. Was one of the goals of VCEG-N52 to increase the
21 number of transmissions of parameters or reduce the number
22 of transmissions?

23 A. As it says there, to reduce the number of
24 transmissions.

25 Q. If you split the single parameter set structure

1 VCEG-N52 into multiple steps, would that increase or reduce
2 the number of transmissions?

3 A. That would increase the number of transmissions.

4 Q. Now, at this meeting of the video coding expert
5 groups where VCEG-N52 was presented, how was it initially
6 received?

7 A. It was received well. People talked about it and
8 used it.

9 Q. After this meeting of the Video Coding Expert
10 Group, did anyone identify a problem with the single
11 parameter set structure VCEG-N52?

12 A. Yes, sir, there was a proposal that identified a
13 problem with this.

14 Q. And how authored that proposal?

15 A. That proposal was authored by Drs. Hannuksela and
16 Dr. Wang.

17 Q. We can jump to slide 3.

18 Do you see Dr. Kia callouts from the '818 patent?

19 A. I do see that.

20 Q. Does the '818 patent expressly distinguish its
21 invention from VCEG-N52?

22 A. Yes, sir, it does.

23 Q. Do you see on the screen where it says VCEG-N55,
24 is that supposed to be N52?

25 A. So as I discuss that in my earlier presentation,

1 that's a typo. The authors are referring to VCEG-N52 there.

2 Q. What did Drs. Hannuksela and Wang say was the
3 problem with the single parameter set structure of VCEG-N52
4 in the '818 patent?

5 A. So that's what I have highlighted at the bottom.
6 And generally they are saying that the frequency of change
7 in parameters varies. And that if you put all of the
8 parameters in one parameter set, if one of the parameters
9 that are more susceptible to change changes, then you have
10 to send the entire parameter set, even the ones that did not
11 change.

12 Q. Turning to slide 4, or actually let's skip over.
13 Let's go to slide 5.

14 Dr. Kia, does VCEG-N52 render obvious the claims
15 of the '818 patent?

16 A. No, it does not.

17 Q. Does VCEG-N52 render obvious the sequence
18 parameter set of element 6b, 15c, and claim 8?

19 A. No, it does not.

20 Q. Does VCEG-N52 render obvious the picture
21 parameter set of element 6c, 15d, and claim 8?

22 A. No, it does not.

23 Q. Why would it not be obvious to split VCEG-N52's
24 single parameter set structure into multiple parameter sets
25 in light of its goal to reduce the number of transmissions?

1 A. Well, if you split them, you're increasing the
2 number of transmissions. Instead of sending one parameter
3 set, you have to send two parameter sets.

4 Q. Do you understand that Dr. Storer tried to fill
5 these gaps in VCEG-N52 with a reference called Sriram?

6 A. Yes, I remember that.

7 Q. Let's jump to slide 6. Does Sriram disclose
8 parameter sets?

9 A. No, it does not. It uses headers.

10 Q. Looking at slide 6 here if you look at the
11 callout at the top, what types of headers does Sriram
12 disclose?

13 A. It discloses the picture sequence and GOP
14 headers.

15 Q. So it discloses three different types of headers;
16 is that correct?

17 A. That's correct.

18 Q. And does Sriram require that these headers be
19 used in the bitstream to convey parameters?

20 A. No, it does not.

21 Q. And so Sriram here, does it provide any
22 alternative -- let me rephrase. Does Sriram describe using
23 parameter sets or headers to convey parameters?

24 A. Well, it uses the headers. It utilizes the
25 headers to get access to the parameters.

1 Q. Now, do you recall Dr. Storer's testimony
2 regarding data structures created in Sriram yesterday?

3 A. Yes, sir, I remember that.

4 Q. I think it may have been two days ago now. Do
5 you recall that?

6 A. Yes, I do.

7 Q. All right. Does the encoder or decoder create
8 the data structures that Dr. Storer pointed to in Sriram?

9 A. What he pointed to is the decoder that's creating
10 those structures.

11 Q. How were those data structures populated in
12 Sriram?

13 A. They were populated based on their use for
14 parallel processing.

15 Q. And was the data that was used for this parallel
16 processing extracted from the headers that Sriram discloses?

17 A. Yes, it was.

18 Q. And can you explain what this parallel processing
19 is that is disclosed in Sriram?

20 A. Absolutely. So as the highlight at the top, it
21 says that when the parameters are extracted which are needed
22 for processing an individual macroblock, so Sriram discloses
23 using multiple processors and each macroblock can be
24 assigned to a different processor.

25 So decoding each macroblock requires parameters.

1 So each one of those processors requires access to those
2 parameters.

3 So what he does is after extracting the
4 parameters from the headers, it makes -- it copies those
5 parameters and makes it available to local processors such
6 that the processors that are running in parallel would all
7 have access to those parameters after decoding their
8 macroblocks.

9 Q. How is Sriram's disclosure of copying these
10 parameters and using parallel processing incompatible with
11 VCEG-N52?

12 A. That would increase the number of transmissions,
13 again, undo what N52 is trying to do.

14 Q. Now, do you recall Dr. Storer attempting to
15 illustrate an animation that combined the data structures of
16 Sriram and VCEG-N52?

17 A. I do recall that.

18 Q. Did you agree with Dr. Storer's animations?

19 A. No, not at all.

20 Q. What were the problems with Dr. Storer's
21 animations?

22 A. Well, it would create problems for the -- one of
23 ordinary skill in the art trying to implement that. That
24 wasn't there before.

25 Q. Thank you, Dr. Kia. Why don't we turn to slide

1 7.

2 Now, would a person of ordinary skill in the art
3 would be motivated to combine VCEG-N52 and Sriram?

4 A. No, they would not.

5 Q. Now, if you look at the excerpts on the left,
6 what does VCEG-N52 disclose should be done with picture
7 headers and H.26L?

8 A. What it shows on the left is that the
9 transmission of picture headers is unnecessary. There is
10 also disclosure that there is no picture header in H.26L.

11 H.26L was the Working Draft at the time that
12 ended up being H.264. At the time when N52 was proposed
13 there was an adoption that they are not going to use picture
14 headers.

15 Q. Given that VCEG-N52 proposes to completely remove
16 headers like picture headers, would a POSITA have been
17 motivated to combine Sriram and VCEG-N52?

18 A. No, they would not.

19 Q. And why not?

20 A. Well, because N52 is not using picture headers
21 and Sriram is using picture headers.

22 Q. Are those polar opposite solutions?

23 A. Yes, they are opposite.

24 Q. All right. Let's go to slide 8 and apply your
25 opinions regarding the combination of VCEG-N52 and Sriram to

1 the elements.

2 Assuming a person of ordinary skill would have
3 combined these two references, does the combination render
4 obvious a picture parameter set?

5 A. No, it does not.

6 Q. Would the combination render obvious a sequence
7 parameter set?

8 A. No, it would not.

9 Q. Do either Sriram or VCEG-N52 disclose separate
10 parameter sets?

11 A. No, they do not.

12 Q. Okay. Let's look briefly at claim 6 of the '818
13 patent.

14 Do the asserted claims of the '818 patent, are
15 they directed to a problem particular to video coding?

16 A. Yes, sir, they are.

17 Q. Do the claims have any application outside of the
18 context of video coding?

19 A. No, they do not.

20 Q. Do you see the callout on the right from column
21 6, do you see the statement that the invention improves
22 compression efficiency?

23 A. Yes, sir, I do see that.

24 Q. How does the invention of the '818 improve
25 compression efficiency in video coding?

1 A. As I described earlier, by placing parameters
2 that are more likely to change in a separate parameter, it
3 improves compression but by not having to transmit
4 parameters that do not change. So it saves bits in
5 transmission and achieve higher compression efficiency.

6 Q. Does the invention of the '818 patent reduce
7 complexity in the decoder?

8 A. Yes, sir, it does.

9 Q. How so?

10 A. So in reading, parsing, using the parameter set
11 as the semantics and syntax shows, there are processing
12 elements in forming those parameters. So both the encoder
13 and the decoder do not repeatedly have to process those
14 parameters to be placed in headers.

15 So you do that once and that's it. So if the
16 parameters don't change, you do not have to perform extra
17 processing. It's a simpler process.

18 Q. Thank you, Dr. Kia.

19 I would like to jump forward and start discussing
20 validity of the '321 patent. Okay?

21 A. Okay.

22 Q. We have limited time today so for today I would
23 like to just focus on your opinions related to the Kim
24 reference. Is that fair?

25 A. That's correct.

1 Q. What type of system is the Kim reference directed
2 to?

3 A. It's a system for time lapsed recording and
4 reproduction.

5 Q. What is time lapse?

6 A. Time lapse is a generic process where not all the
7 images are stored. There are events that occur and as Kim
8 discloses that it is used for security systems for
9 monitoring and recording activities, so activities such as a
10 door opening captures an image. A person goes in the field
11 of view, captures an image, light turns on, captures an
12 image.

13 So those images are recorded into the system.

14 Q. Does the time lapse system of the Kim reference
15 record images for the purpose of being played back in a
16 continuous video?

17 A. No, it does not.

18 Q. Why not?

19 A. Well, because if you even play back this time
20 lapse when a door opens, when a face appears, that's not a
21 continuous video sequence. That is pleasant to watch. It
22 is very rough. It is very jagged. It changes rapidly. So
23 that's not a normal video sequence.

24 Q. If we can turn to slide 13. Do you see Figure 4,
25 Dr. Kia?

1 A. Yes, sir, I do see that.

2 Q. Do you recall there was a bit of discussion about
3 Figure 4 in Dr. Saber's examination?

4 A. I remember that, yes.

5 Q. Okay. What is the action that starts the
6 operations of Figure 4?

7 A. The action that starts it up there where it says
8 start in an oblong button, a user initiates a retrieval of
9 the image by indicating which image they want to see and if
10 it is a P-frame, it initiates the decoding of the P-frame.

11 Q. Okay. What is the result of performing the
12 operations of Figure 4 on a user selected image frame?

13 A. So the outcome of that, that's at the very end,
14 callout box 39, it outputs an image into the screen.

15 Q. Does Figure 4 produce a single image or a
16 sequence of images?

17 A. It produces a single image.

18 Q. Does Kim disclose repeating Figure 4 to create a
19 sequence of images?

20 A. No, it does not.

21 Q. Do you understand that Dr. Saber has opined that
22 it would be obvious to repeat Figure 4 for a sequence of
23 images?

24 A. I understand that's what he said, yes.

25 Q. Do you agree with Dr. Saber?

1 A. No, I do not.

2 Q. Why not?

3 A. Well, in repeating this process, there is
4 problems that would arise that was not there to begin with.

5 Q. What types of problems would arise?

6 A. Well, for example, as -- let's just say we start
7 with an I-frame. It goes through the process. It goes to
8 the left of S32 and displays the I-frame after decoding the
9 I-frame. The next P-frame comes along and it goes and
10 decodes it. Now, the I-frame is gone. And after S32, where
11 it says yes, it goes and has to go find the I-frame yet
12 again, decode it yet again and go back.

13 This is very time-consuming. It is very process
14 intensive and has to do that repeatedly for each P-frame.
15 If a user even solves that and finds a way to store the
16 I-frame knowing that it is going to reuse it, then another
17 problem pops up is that when -- what are you going to do
18 when the next I-frame comes along? How are you going to
19 know to replace that?

20 All of these problems are not present in Kim as
21 it stands with a single image retrieval.

22 Q. Thank you, Dr. Kia.

23 Do you agree, though, that Kim discloses storing
24 pictures as a sequence?

25 A. Yes, I understand that. I understand that's the

1 process, yes.

2 Q. Why does the Kim reference disclose storing
3 pictures as a sequence?

4 A. Well, it is a time lapse recording device. You
5 take a picture at a time. There is no other thing that it
6 does in the middle. So it just takes pictures, stores it,
7 takes a picture, stores it. And that is a sequential
8 process so when it records it into the median, which I
9 believe it says optical disk, it appears as a set of images
10 one after the other.

11 Q. Can you explain your opinion as to how Kim
12 discloses storing pictures in a sequence but does not render
13 obvious decoding a video sequence?

14 A. Well, decoding a sequence requires a fluidity
15 between the frames. You need to be able to compress and be
16 able to process it. There are both requirements that need
17 to be met.

18 Q. Thank you, Dr. Kia. Let's jump to slide 16.

19 Do you see on slide 16 is a demonstrative that
20 Dr. Saber used in his direct examination the other day?

21 A. I do see that.

22 Q. And here Dr. Saber was analyzing limitations 8b
23 and 10b?

24 A. Yes, sir, I remember that.

25 Q. Do you agree with Dr. Saber that these

1 limitations are rendered obvious by Kim?

2 A. I do not agree, no.

3 Q. Do you understand that Dr. Saber pointed to the
4 series of zeros in that red box as the indication of the
5 first frame in these elements?

6 A. I remember that is what he said, yes.

7 Q. Do you agree with Dr. Saber that those are an
8 indication of a first image frame to be decoded?

9 A. No, I do not agree.

10 Q. Okay. In Kim, who chooses the image to be
11 decoded?

12 A. That's the user.

13 Q. And if the user selects the image to be decoded,
14 why does the 000 not indicate the first image frame in
15 decoding order?

16 A. Well, that's because when the user selects an
17 image such as P2, the system goes and retrieves P2 and
18 starts initializing -- starts decoding right away. Once it
19 knows that it is a P-frame, then it makes a decision that I
20 need to go retrieve that I-frame. That's what the IAD arrow
21 is, X001. So it knows that IAD address is X001, gets the
22 I-frame and then decodes the I-frame.

23 It is the user that selects the picture to
24 decode.

25 Q. Does Figure 4 disclose checking this series of

1 zeros to determine which frame to use to start decoding?

2 A. No, it does not.

3 Q. All right. Dr. Kia, let's jump to slide 17.

4 Do you recall Dr. Saber's testimony regarding
5 this demonstrative and the limitations 8c and 10c?

6 A. Yes, I understand that's what he said, yes.

7 Q. Do you agree with Dr. Saber that these
8 limitations are rendered obvious by Kim?

9 A. I do not agree, no.

10 Q. In Kim, what determines where the decoding
11 starts?

12 A. With Kim, again, it is the user. The user
13 selects the image.

14 Q. If a user selects to decode a P-frame, what type
15 of frame is decoded first?

16 A. The P-frame is decoded first.

17 Q. And if we look at Figure 4, where would the
18 decoding of the frame begin?

19 A. That would be in step S30 where it says reverse
20 quantization, reverse transformation.

21 Q. How is Kim's user focus design different than the
22 claim requirement that decoding start from an image
23 identified in the bitstream?

24 A. So in Kim, the user initiates the decoding
25 process at a specific image. What is claimed is when --

1 when access is requested, that you go to what is the
2 indication and start decoding from the indication.

3 Q. Thank you, Dr. Kia. Let's jump to the last
4 element, which is limitations 8e and 10e.

5 Do you recall this demonstrative from Dr. Saber's
6 testimony?

7 A. Yes, sir, I remember that.

8 Q. Do you agree with Dr. Saber that these
9 limitations are rendered obvious by Kim?

10 A. No, I do not agree with that.

11 Q. For the functionality of resetting the identifier
12 that Dr. Saber pointed to in his testimony, did he point to
13 functionality in the encoder or the decoder?

14 A. He pointed to the functionality at the encoder.

15 Q. Does the claim require the resetting to occur in
16 encoder or a decoder?

17 A. The claims are required to perform that step at
18 the decoder.

19 Q. So given the Kim's disclosure of resetting the
20 identifier at the encoder, how does that inform your opinion
21 regarding whether these limitations would have been obvious
22 or not?

23 A. Yeah. Confirms my opinion that it would not be
24 obvious.

25 Q. And why wouldn't it be obvious?

1 A. Well, for several reasons. One is that one of
2 ordinary skill in the art looking at Kim, that it sets that
3 to zero in the encoder, that value serves no function in the
4 decoding. The IAD is the address to reference an I-frame.
5 For an I-frame, that IAD does not serve any purpose. Its
6 sole purpose is to reference where the I-frame is for the
7 P-frames.

8 So it would not be obvious to add functionality
9 that was not there.

10 Q. Thank you, Dr. Kia. Let's jump to one last slide
11 and to summarize your opinions, does the Kim reference
12 render obvious the limitations on this screen that have a
13 big X next to them?

14 A. No, they do not. No, Kim does not.

15 Q. Thank you, Dr. Kia.

16 MR. FRIST: I will pass the witness.

17 JUDGE ELLIOT: Very well.

18 Mr. Klein, how long do you expect to be?

19 MR. KLEIN: Between myself and Ms. Brewer, about
20 25 minutes, Your Honor.

21 JUDGE ELLIOT: All right.

22 MS. BREWER: We might actually be closer to 15,
23 20.

24 JUDGE ELLIOT: Can you turn your microphone on,
25 please?

1 MS. BREWER: We might actually be closer to 15
2 minutes because he didn't present on MPEG-1 and so that cuts
3 down significantly on my outline.

4 JUDGE ELLIOT: All right. So in that case then
5 let's finish with Dr. Kia and then I will reconsider a lunch
6 break. Go ahead, Mr. Klein.

7 MR. KLEIN: Thank you, Your Honor.

8 CROSS-EXAMINATION

9 BY MR. KLEIN:

10 Q. Dr. Kia, I want to talk about VCEG-N52 and
11 Sriram. One of your disputes with Dr. Storer that there is
12 no motivation to combine VCEG-N52 and Sriram, right?

13 A. That's correct.

14 Q. Your opinion is that a POSITA wouldn't put those
15 to references together, correct?

16 A. That's correct.

17 Q. I want to talk a little bit about H.264. You
18 agree with me that H.264 uses motion compensation, right?

19 A. Generally, yes. I do not believe I provided any
20 opinion about that.

21 Q. That's fine. But H.264 generally uses motion
22 compensation, right?

23 A. Okay. I did not provide any opinion, but
24 generally it does.

25 Q. And H.264 uses a discrete cosine transform,

1 right?

2 A. Again, I did not provide any opinion on that, but
3 it does use it, yes.

4 Q. And H.263 uses motion compensation, right?

5 A. Again, I did not provide any opinion on that, but
6 generally yes.

7 Q. So yes? H.263 uses motion compensation?

8 A. So I did not provide any opinion on that but
9 generally yes.

10 Q. And H.263 uses a discrete cosine transform,
11 right?

12 A. So I did not provide any opinion on that, but
13 generally, yes.

14 Q. And, in fact, if we go back to even earlier
15 standards like MPEG-1, MPEG-1 uses motion compensation,
16 right?

17 A. I did not provide any opinion on that, but
18 generally yes.

19 Q. MPEG-1 generally uses a DCT, right?

20 A. I did not provide any opinion on that, but
21 generally yes.

22 Q. But you still think that no one would use Sriram
23 with VCEG-N52; do I have that right?

24 A. So can you repeat the first part of your
25 question?

1 Q. But you think that a POSITA wouldn't combine
2 VCEG-N52 and Sriram, right?

3 A. Well, that's correct. I thought it was a
4 different question prior.

5 Q. All right. Let's pull up Sriram. May we have
6 RX-5188.

7 Column 1, lines 19 to 27. Do you see that,
8 Dr. Kia?

9 A. Yes, sir, I do.

10 Q. And it says "the combination of motion
11 compensation and discrete cosine transform MC-DCT is used in
12 a number of standards, including MPEG-1, MPEG-2, MPEG-4,
13 H.261, and H.263.

14 "Although the present invention is disclosed in
15 the context of MPEG-1 and MPEG-2, decoders for the purpose
16 of illustration, the present invention is equally applicable
17 to any other MC-DCT scheme."

18 Did I read that correctly?

19 A. Yes, you did.

20 Q. Now, you have another disagreement with
21 Dr. Storer about combining VCEG-N52 and Sriram, right?

22 A. I have -- I think I have talked about it.

23 Q. So your opinion is that VCEG-N52 and Sriram are
24 incompatible technical solutions, right?

25 A. That's correct.

1 Q. So your opinion is that you physically can't
2 combine the two references, correct?

3 A. Well, you cannot combine those two references. I
4 don't understand what you mean by physically.

5 Q. You couldn't put the two references together,
6 right?

7 A. It doesn't make sense to put them together, yes.

8 Q. Okay. So you also opined that VCEG-N52 claims to
9 make more transmissions of headers unnecessary, right?

10 A. Well, that's one of them but it says more
11 transmissions, i.e., headers, not necessary.

12 Q. But you testified to that on your direct,
13 correct?

14 A. I did.

15 Q. Okay. But VCEG-N52 expressly describes using as
16 part of its design slice headers that contain information on
17 which parameter set to use. You agree with that, right?

18 A. So VCEG-N52 does have parameters in the slice
19 header, and they have to connect to the other parameters
20 somehow.

21 Q. Let's take a look at VCEG-N52. Can I have
22 JX-1170, please. Go to page 4.

23 The second paragraph, please.

24 Do you see that, Dr. Kia?

25 A. Let me read that.

1 Q. I will read it right now. It says, "the video
2 decoder receives all correctly transmitted partitions in the
3 correct order. It maintains a number of parameter set
4 storages. The header partition of each slice contains
5 information which parameter set to use."

6 Did I read that correctly?

7 A. Yes, sir, you did.

8 Q. I want to talk about one final thing. May we
9 have CDX-14C, please.

10 Go to slide 2.

11 Now, you recall this slide from your direct,
12 right, Dr. Kia?

13 A. Yes, sir, I remember that.

14 Q. And I thought this was a nice graphic. You made
15 it look like it was a group project. Sitting around this
16 table you have Stephan Wenger and Thomas Stockhammer, right?

17 A. Yes, sir.

18 Q. And we have heard a lot about their contributions
19 to the JVT, correct?

20 A. They made quite a few contributions, yes.

21 Q. Right. They introduced the concept of parameter
22 sets, didn't they?

23 A. They introduced the concept in VCEG-N52 of a
24 single parameter set.

25 Q. Well let's look at your report, your opening

1 report, RX-5331, paragraph 186.

2 The last sentence, the last two sentences. "The
3 higher layer information that was previously transmitted in
4 slice headers would instead be sent in a structure known as
5 a parameter set. The concept of a parameter set was first
6 introduced in ITU-T document VCEG-N52, submitted by Stephan
7 Wenger and Thomas Stockhammer."

8 Did I read that correctly?

9 A. Absolutely, yes.

10 Q. Can we go back to CDX-14C.2, please.

11 You also have a picture of Gary Sullivan from
12 Microsoft, right?

13 A. Yes, sir.

14 Q. And I am not going to go over it, but we have
15 heard about his contributions to the JVT, correct?

16 A. I believe he was the chair. He made a lot
17 happen.

18 Q. And you also have a picture from Thomas Wiegand
19 from Fraunhofer, correct?

20 A. Correct.

21 Q. We have heard about his contributions to the JVT,
22 right?

23 A. That's correct.

24 Q. Dr. Hannuksela is also at the table, correct?

25 A. That's correct.

1 Q. And we have heard about what he did, right?

2 A. That's correct, yes.

3 Q. And he posed four parameter sets to the JVT,
4 correct?

5 A. It says in the example.

6 Q. And the group rejected his four parameter set
7 proposal, correct?

8 A. I cannot quite agree with that, no.

9 Q. Let's go to RDX-0097C, page 69, please.

10 Do you remember this demonstrative from
11 Dr. Storer's presentation?

12 A. Yes, I do.

13 Q. At the top we have an excerpt from RX-5200. And
14 the highlighted part says "the group decided to have only
15 the independent GOP parameter set. Some of the proposed
16 parameters were considered potentially unnecessary."

17 Did I read that correctly?

18 A. Yes, you did.

19 Q. At the bottom we have another excerpt. This one
20 from RX-0044. "Resolution: The group stripped off the list
21 of proposed parameters and at the end only the independent
22 GOP parameter set remained."

23 Did I read that correctly?

24 A. Yes, you did.

25 Q. May we go back to CDX-14C.2, please.

1 In looking at this table, I think you left some
2 people off, didn't you, Dr. Kia?

3 A. There are other people. These are the main
4 stakeholders.

5 Q. Right. We heard the other day about the guys
6 from Sony, right?

7 A. That's correct, yes.

8 Q. They are not depicted at this table, right?

9 A. No, they are not.

10 Q. Okay. Dr. Kia, I think we all know the problem
11 with group projects, don't we?

12 A. I don't understand your question.

13 Q. A person who does the least amount of work takes
14 all the credit. Other than Nokia, are you aware of anyone
15 else at the table who went out and got a patent on the
16 group's work on parameter sets?

17 A. I do not have that information.

18 MS. BREWER: Your Honor, Robin Brewer on behalf
19 of Respondents. I will be asking Dr. Kia questions related
20 to the '321 patent.

21 JUDGE ELLIOT: Very well.

22 CROSS-EXAMINATION

23 BY MS. BREWER:

24 Q. Good afternoon, Dr. Kia.

25 A. Good afternoon.

1 Q. You have a general understanding of the legal
2 principles relevant to your validity analysis, right?

3 A. General legal understanding?

4 Q. Yes.

5 A. So I have been informed by counsel. I may have
6 an understanding of them but I am not a lawyer.

7 Q. And in forming your opinions, you applied your
8 understandings, right?

9 A. That's correct, I did.

10 Q. You agree with me that if a reference teaches all
11 claim limitations, it invalidates the claim, right?

12 A. Again, I am not a lawyer but that seems to be the
13 requirements of what generally is referred to as
14 anticipation.

15 Q. So let's talk about a reference that contains two
16 examples. Okay?

17 A. Yes, ma'am.

18 Q. And one of those two examples teaches all claim
19 limitations. Okay?

20 A. Okay.

21 Q. The second one does not. Are you following me?

22 A. No.

23 Q. So you have one example that teaches all claim
24 limitations and a second one that does not?

25 A. Okay.

1 Q. All right. That two-example reference still
2 invalidates the claim, right?

3 A. So it depends. If you are applying anticipation
4 or obviousness, obviousness, which is a combination of prior
5 arts from my understanding that it has other requirements to
6 meet.

7 Q. Okay. So it is a yes/no question. The two
8 example reference, say it's under obviousness, still
9 invalidates the claim, right?

10 A. Again, I'm not a lawyer. If you are applying two
11 references to a patent, it's my understanding that you need
12 to apply obviousness. There is some burdens such as, and
13 maybe I cannot recite all of them, but reason to combine is
14 what comes to my mind.

15 Q. So single reference? It's a single reference,
16 not two references, a single reference with two examples?
17 And one of those examples discloses all claim limitations.

18 That reference invalidates the claim, right?

19 A. Okay. So if a single reference teaches all of
20 the elements and it is -- if it shows all of the elements,
21 that would be anticipation. That would be grounds for
22 invalidity.

23 Q. Thank you, Dr. Kia.

24 All right. I am going to ask you a few questions
25 about Kim. So if we could pull up your slide 16, which is

1 CDX-14C.16.

2 Kim teaches the use of only I- and P-pictures,
3 right?

4 A. Kim utilizes only those two picture types, yes.

5 Q. Right. So Kim is not discussing B-pictures; is
6 that right?

7 A. That's correct. It does not use B-pictures.

8 Q. For Figure 5A, Kim teaches that each P-picture
9 has an IAD, right?

10 A. For each P-picture it does include an IAD, that's
11 correct.

12 Q. And that IAD indicates the I-picture each
13 P-picture relies on as a reference picture, right?

14 A. Yes. It refers -- so it uses that as the address
15 to where to go find the I-picture.

16 Q. Kim teaches that in Figure 5A, the corresponding
17 I-picture used for -- used for reference by each P-picture
18 is the previous I-frame. Is that right?

19 A. Can you repeat your question?

20 Q. Sure. Kim teaches that Figure 5A, the
21 corresponding I-picture used for reference by each P-picture
22 is the previous I-frame, right?

23 A. Generally, yes. That's my understanding.

24 Q. So, Dr. Kia, I am about done with my questioning,
25 which is, I will be honest, much shorter than I expected.

1 And that is because you did not talk about MPEG-1 during
2 your direct testimony, right?

3 A. I did not provide any evidence, no.

4 Q. So even though Dr. Saber presented his opinions
5 that MPEG-1 invalidated the claims, you provided no
6 testimony today in response to Dr. Saber's opinions,
7 correct?

8 A. Again, I did not provide any evidence in that
9 area.

10 Q. Is that because you saw that Dr. Hannuksela, the
11 inventor of the '321 patent, said that the IDR structure in
12 H.264 that you accused of infringement is the same as MPEG's
13 closed_GOPs?

14 A. My opinions about that are already captured.
15 I just did not provide any evidence regarding that at trial.

16 Q. Okay. Well, let's see what Dr. Hannuksela had to
17 say. Dr. Hannuksela is also one of the inventors of the
18 '818 patent, right?

19 MR. FRIST: Your Honor, I object to this question
20 as outside the scope of the direct. We did not get into
21 MPEG-1 and now we're going into cross-examination on MPEG-1.

22 MS. BREWER: Your Honor, this isn't a
23 cross-examination about what MPEG-1. This is about what Dr.
24 Hannuksela said in the '818 patent for which he is a common
25 inventor between the '818 patent and the '321 patent.

1 JUDGE ELLIOT: Well, the question is simply was
2 Dr. Hannuksela one of the inventors of the '818 patent. So
3 overruled.

4 BY MS. BREWER:

5 Q. So, Dr. Hannuksela is also one of the inventors
6 of the '818 patent, right?

7 A. He is a coinventor, correct.

8 Q. And you provided opinions on the '818 patent in
9 this investigation, right?

10 A. That's correct, I did.

11 Q. So you read the '818 patent repeatedly and
12 carefully, correct?

13 A. I read it many times, yes.

14 Q. Okay. Let's look at the '818 patent at column 1,
15 lines 66 to column 2, line 5.

16 Dr. Hannuksela writes: "In the JVT coding
17 standard, a coded video sequence is an entity containing all
18 coded pictures from an IDR picture (inclusive) to the next
19 IDR picture (exclusive) in decoding order."

20 Do you see that?

21 A. Well, I see that. I don't know where in
22 relevance to the patent that is.

23 Q. Okay. This is at lines -- column 1, lines 66 to
24 column 2, line 5.

25 And that sequence that I just read from IDR frame

1 to IDR frame is exactly the independent sequence that you
2 identified in H.264, right?

3 A. I am lost. I need to understand where from the
4 patent this excerpt is coming from.

5 Q. Are you saying that this isn't in the '818
6 patent?

7 A. No, that's not what I'm saying. I was trying to
8 understand your question of what that means, I need to
9 understand where this is coming from.

10 Q. Okay. So the sentence I just read, you
11 understand that that describes that an IDR picture goes from
12 the beginning of an IDR picture to the next IDR picture,
13 right?

14 A. Yeah, so my question is, I need to understand the
15 context of where that is written and for what reason.

16 Q. Dr. Kia, I need you to just answer my questions
17 here. Okay?

18 A. Okay.

19 Q. So the next question, you understand what this
20 sentence is saying, right?

21 A. I mean, it is just saying in a coded video
22 sequence there are pictures from IDR picture to IDR picture.

23 Q. And that is what you said is the independent
24 sequence that you identified in H.264, right?

25 MR. FRIST: Your Honor, I will object as outside

1 the scope again. We're getting into the H.264 standard
2 which is infringement issues. I didn't mention H.264
3 standard. I think again we're going well beyond the scope
4 of the direct.

5 MS. BREWER: Your Honor.

6 JUDGE ELLIOT: Yes.

7 MS. BREWER: This is not outside the scope of the
8 direct. It is not outside the scope of -- it is not getting
9 into infringement or anything like that. It's just trying
10 to confirm his understanding.

11 JUDGE ELLIOT: Well, I will sustain that but you
12 can rephrase that. Just try not to reference the H.264,
13 please.

14 BY MS. BREWER:

15 Q. Okay. So Dr. Hannuksela here continues that, "in
16 other words, a coded video sequence according to the JVT
17 coding standard corresponds to a closed group of pictures
18 (GOP) according to MPEG-2 video."

19 Did I read that correctly?

20 A. Yes, you did.

21 MS. BREWER: No further questions.

22 JUDGE ELLIOT: All right.

23 MS. DUCCA: No questions from Staff.

24 JUDGE ELLIOT: Very well. Mr. Frist?

25 MR. FRIST: Your Honor, I have no redirect, so I

1 think that concludes witnesses.

2 JUDGE ELLIOT: Very well. All right.

3 Thank you, Dr. Kia.

4 THE WITNESS: Thank you, sir.

5 (The witness stood down.)

6 JUDGE ELLIOT: So, all right. Let's just press
7 on. I have a few things to talk about. I don't think it
8 will take more than a few minutes and I will hear from the
9 parties if there is anything the parties want to raise.

10 So first, I like this practice of putting up
11 slides in a slide deck that alerts everyone that there is
12 going to be confidential material. I have never seen that
13 before. I think that's good. That's a good way of putting
14 in a guardrail and particularly in this case because I have
15 had an unusually large number of instances where there has
16 been a dispute about what is confidential and what isn't.
17 So I encourage counsel to continue to do that in the future.

18 Second, NEXT advocates. Now, I want to take a
19 note of who the NEXT advocates were. I have down so far the
20 only one that I can took note of as Ms. Simenauer. Is there
21 anyone else for Complainants?

22 MR. SWAIN: You read that correctly, Your Honor.
23 That was our NEXT advocate.

24 JUDGE ELLIOT: All right. Very good. Anyone
25 from Respondents?

1 MS. BREWER: Yes, Your Honor, Karl Johnston was
2 our NEXT advocate. He did the direct of Dr. Nisha Mody.

3 JUDGE ELLIOT: Okay. What firm is Mr. Johnston
4 with?

5 MS. BREWER: Mr. Johnston is with Perkins Coie.

6 JUDGE ELLIOT: Very good. Okay.

7 Next. Demonstratives. I believe that I -- no, I
8 overruled every objection to demonstratives. And I intend
9 to admit them in their entirety. If anybody objects, speak
10 now.

11 MR. SWAIN: No objection from Complainants, Your
12 Honor.

13 JUDGE ELLIOT: Very well. All right.

14 Then hearing no other, hearing no objections I
15 will admit all the demonstratives.

16 (Exhibits, as submitted by counsel and reflected
17 in the attached index, were received into evidence.)

18 JUDGE ELLIOT: Page limits: So I think given the
19 fact that there are public interest I should probably make
20 it longer than usual so I will give you 200 pages for your
21 opening briefs and I have recently found that reply briefs
22 are not as helpful as I thought they were. So I will give
23 you 110 pages for reply briefs.

24 Okay. The only other thing I want to talk about
25 --

1 MS. ASCARRUNZ: Sorry, Your Honor, just one
2 question on the briefing.

3 JUDGE ELLIOT: Ms. Ascarrunz, say it again?

4 MS. ASCARRUNZ: I will come up to the podium.
5 Just one question on the briefing, Your Honor. The parties
6 have discussed and we understand in the 1390 investigation
7 you also accommodated the parties' request to convert the
8 page limits to word limits so that the parties could use
9 figures in the briefing. And Staff is in agreement and the
10 parties are in agreement to have that request here if Your
11 Honor would be okay with it.

12 JUDGE ELLIOT: Allright. So let me think about
13 this. I would say then 50,000 words for your opening brief
14 and let's say -- I will give you a little bit more. I will
15 give you 35,000 -- no. Let's say 27,000 for your reply. I
16 guess that's equivalent to, what, 108 pages? That's good
17 enough. Okay. So 50,000 and 27,000 words.

18 MS. ASCARRUNZ: Understood. Thank you, Your
19 Honor.

20 JUDGE ELLIOT: Okay. Very good. So the only
21 other thing I want to talk about is I am -- I wouldn't say I
22 am troubled but it has been weighing on my mind there is no
23 quorum for this case or the 1379.

24 And although, you know, I don't like getting
25 reversed any more than any other judge does, the reality is

1 I think that the best practice is to have the Commission
2 review my final initial determination and that includes in
3 my case, because my practice is to put the recommended
4 determination in the same paper as the initial
5 determination, that they review everything all at once.

6 So I am interested. We don't have to talk about
7 this now, I am interested in hearing in your post-hearing
8 briefs what if anything I should do about that. If your
9 position is I imagine Nokia would take this position is I
10 should just proceed as if there were a quorum. That's fine.
11 If your position is that I should do something else, then I
12 will be interested in knowing what it is.

13 What I had in mind in particular is that I may
14 end up extending the target date so that I could extend the
15 ID due date to increase the chances that there would be a
16 quorum at some point for the Commission so the Commission
17 can act on my ID.

18 I believe the law is that if I issue an ID
19 separate from the RD, if I issue an ID and 60 days go by and
20 the Commission does not review it, it becomes the final
21 agency action. And I want -- I am considering trying to
22 avoid that. That's why I have contemplated possibility of
23 extending the target date.

24 Maybe not. I haven't made my mind up about this.
25 This is something that I have not encountered before at the

1 ITC. And so I don't know. But if the parties want to
2 present something to me in your briefs, I encourage you to
3 do so. And I will take a look at that.

4 In the end, I may end up doing nothing, but we
5 will see. Okay? Okay.

6 I think that's it for me. Is there anything that
7 the parties wish to raise? I will start with Complainants.

8 MR. SWAIN: Thank you, Your Honor. One minor and
9 one very important thing. First the minor issue. CX-8732C
10 is the deposition designations of Mr. Hannuksela that we
11 have discussed before. I don't think that made it on to the
12 initial exhibit list when we moved it informally so I would
13 like to move that in now.

14 JUDGE ELLIOT: All right. Any objection?

15 Very well. That will be admitted.

16 (Complainant's Exhibit Number CX-8732C was
17 received into evidence.)

18 MR. SWAIN: Last, Your Honor, I want to on behalf
19 of the parties and Staff thank you and your associates for
20 your time today; and, of course, the court reporter for her
21 excellent service as usual.

22 JUDGE ELLIOT: Thank you. Respondents?

23 MR. MILLER: The issue of physical exhibits, Your
24 Honor, including source code. We just wanted to understand
25 how you wanted us to provide those to you and what physical

1 exhibits you would like, in addition to source code
2 exhibits. For example, there are physical computers that
3 are on the physical exhibit list, the redesigned products
4 for HP, for example, Your Honor, and other products from,
5 accused products from Amazon as well.

6 So both of those issues, we would like to
7 resolve. I think there is some discussion the parties have
8 had that we can present to Your Honor regarding what source
9 code physical exhibits should be submitted to you because of
10 the large amount of source code, so I am happy to address
11 that as well, Your Honor.

12 JUDGE ELLIOT: Okay. So as far as the physical
13 exhibits in the form of hardware goes, just put it in boxes
14 and send them to my office. And then it seems unlikely to
15 me that I will even look at them because there is nothing
16 particularly relevant in this case about the hardware
17 itself, but eventually they will make their way to wherever
18 the Commission itself keeps physical exhibits. Send them to
19 my office and they will be treated accordingly.

20 As far as source code goes, I think the best way
21 to do this is for the parties to meet and confer because I'm
22 happy doing it however you want to do it. If there is some
23 source code that you specifically want me to look at because
24 there is some particular line that has some relevant
25 language in it, then you should excerpt those lines in your

1 briefs or if you can reach some sort of an agreement on some
2 sort of summary exhibit that has various excerpts or
3 something, but of course, you know, in this case, the source
4 code, most of it is going to be just like physical exhibits
5 in the sense that I am not even going to open up the papers
6 because, you know, there is so many lines of code that it is
7 just not even relevant here.

8 So I encourage counsel to reach an agreement. If
9 you can't reach an agreement, I will adjudicate whatever
10 dispute you have. And if you do nothing, then my assumption
11 is going to be that you will put them in binders in
12 quantities consistent with the current protective order and
13 put them in boxes, label them as source code, and then send
14 them to me as if they were physical exhibits. Okay?

15 MR. MILLER: Understood, Your Honor. Thank you.

16 JUDGE ELLIOT: All right. Anything from Staff?

17 MS. DUCCA: Nothing from Staff, Your Honor.

18 JUDGE ELLIOT: Very well. All right.

19 Counsel, thank you very much. I look forward to
20 reviewing your post-hearing briefs and thank you for all
21 your hard work. You were very well prepared, and I
22 appreciate that.

23 (Whereupon, at 12:40 p.m., the Evidentiary
24 Hearing concluded.)

25

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

C O N T E N T S

WITNESS	DIRECT	CROSS	REDIRECT	RECROSS	STAFF
ARTHUR LEVIN		1602	1623		
PIERRE MOULIN	1625	1655			
MICHAEL	1672	1691	1708		
ORCHARD					
OMID KIA	1713	1734			
		1741			

CONFIDENTIAL SESSIONS

1605 - 1606

1 E X H I B I T S

2 EXHIBITS RECEIVED

3 CX-8732C 1753

4 EXHIBIT LISTS SUBMITTED FOR ADMISSION:

5 COMPLAINANTS' ADMITTED TRIAL EXHIBITS AND DEMONSTRATIVES

6 (DAY 5 9/13/24)

7 CX-8732C

8 CDX-0003

9 CDX-0004C

10 CDX-0005C

11 CDX-0008C

12 CDX-0009

13 CDX-0010C

14 CDX-0012C

15 CDX-0013C

16 CDX-0014C

17 CDX-0015C

18 CDX-0016C

19 CDX-0018

20 CDX-0019

21 CDX-0020

22 CDX-0021

23 CDX-0022

24 CDX-0023

25 CDX-0024

Heritage Reporting Corporation
(202) 628-4888

1	CDX-0025
2	CDX-0026
3	CDX-0027
4	CDX-0028
5	CDX-0029
6	CDX-0030
7	CDX-0031
8	CDX-0032
9	CDX-0033C
10	CDX-0034C
11	CDX-0035C
12	CDX-0036C
13	CDX-0037C
14	CDX-0038C
15	CDX-0039C
16	1379_CD X-0006C
17	1379_CD X-0007C
18	1379_CD X-0008C
19	1379_CD X-0010C
20	1379_CD X-0011C
21	1379_CD X-0012C
22	1379_CD X-0015C
23	1379_CD X-0016C
24	1379_CD X-0017C
25	1379_CD X-0019C

Heritage Reporting Corporation
(202) 628-4888

1 1379_CD-0020C
2 1379_CD-0021C
3 LIST OF RESPONDENTS' DEMONSTRATIVE EXHIBITS
4 RDX-0001C
5 RDX-0003C
6 RDX-0013C
7 RDX-0014C
8 RDX-0015C
9 RDX-0016C
10 RDX-0019
11 RDX-0027C
12 RDX-0096C
13 RDX-0097C
14 RDX-0098C
15 RDX-0099C
16 RDX-0100C
17 RDX-0101C
18 RDX-0102C
19 RDX-0105
20 RDX-0106
21 RDX-0112
22 RDX-0113C
23 RDX-0114C
24 RDX-0115C
25 RDX-0116C

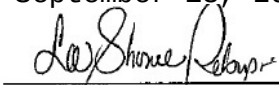
Heritage Reporting Corporation
(202) 628-4888

1 RDX-0117C
2 RDX-0119C
3 RDX-0121C
4 RDX-0122C
5 RDX-0123C
6 RDX-0124C
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

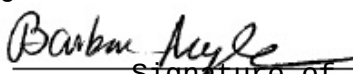
Heritage Reporting Corporation
(202) 628-4888

1 CERTIFICATE OF REPORTER
2 TITLE: Certain Video Capable Electronic Devices
3 INVESTIGATION NO: 337-TA-1380
4 HEARING DATE: September 13, 2024
5 LOCATION: Courtroom A
6 NATURE OF HEARING: Evidentiary Hearing

7 I hereby certify that the foregoing/attached
8 transcript is a true, correct and complete record of the
9 above-referenced proceedings of the U.S. International
Trade Commission.
Date: September 13, 2024

10 SIGNED: 
11 Signature of the Contractor of the
12 Authorized Contractor's Representative
13 1220 L Street, N.W., Suite 206
Washington, D.C. 20005

14 I hereby certify that I am not the Court Reporter
15 and that I have proofread the above-referenced transcript
16 of the proceedings of the U.S. International Trade
Commission, against the aforementioned Court Reporter's
17 notes and recordings, for accuracy in transcription in the
18 spelling, hyphenation, punctuation and speaker
identification and did not make any changes of a
substantive nature. The foregoing/attached transcript is a
true, correct and complete transcription of the
proceedings.

19 SIGNED: 
20 Signature of Proofreader

21 I hereby certify that I reported the above-referenced
22 proceedings of the U.S. International Trade Commission and
caused to be prepared from my tapes and notes of the
proceedings a true, correct and complete verbatim recording
of the proceedings.

23 SIGNED: 
24 Signature of the Court Reporter

25

Heritage Reporting Corporation
(202) 628-4888