

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMCAST CABLE COMMUNICATIONS, LLC,

Petitioner,

v.

ENTROPIC COMMUNICATIONS, LLC,

Patent Owner.

Case IPR2024-00435 Patent 11,381,866 B2

Case IPR2024-00432, Patent 9,210,362

Case IPR 2024-00438 Patent 11,399,206

DEPOSITION OF SAMUEL HARDIE RUSS, Ph.D.

(Taken Virtually)

Tuesday, March 18, 2025

10:12 a.m. EDT

Certified Stenographic Court Reporter

1 VIRTUAL APPEARANCES
2 ON BEHALF OF THE PETITIONER COMCAST CABLE
3 COMMUNICATIONS, LLC:

4 MICHAEL S. CUVIELLO, Esquire
5 FREDERIC M. MEEKER, Esquire
6 JOSHUA L. DAVENPORT, Esquire
7 Banner Witcoff
8 1100 13th Street, Northwest, Suite 1200
9 Washington, DC 20005
10 (202) 824-3307
11 mcuviello@bannerwitcoff.com
12 fmeeker@bannerwitcoff.com
13 jdavenport@bannerwitcoff.com

14 ON BEHALF OF THE PATENT OWNER ENTROPIC COMMUNICATIONS,
15 LLC:

16 PARHAM HENDIFAR, Esquire
17 Lowenstein & Weatherwax LLP
18 1016 Pico Boulevard
19 Santa Monica, California 90405
20 (310) 307-4514
21 hendifar@lowensteinweatherwax.com
22
23
24
25

1 REMOTE DEPOSITION OF SAMUEL HARDIE RUSS,
2 Ph.D., a witness called on behalf of Petitioner,
3 before Amy A. Brauser, RPR RMR CRR, Certified
4 Stenographic Court Reporter and Notary Public, in
5 and for the Commonwealth of Virginia, on Tuesday, the
6 18th day of March, 2025, commencing at 10:12 a.m.

7 * * * * *

8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

1 INDEX OF EXAMINATIONS

2 By Mr. CuvIELlo Page 5

3

4 INDEX OF EXHIBITS

5 NUMBER DESCRIPTION MARKED/IDENTIFIED

6 Exhibit 1016 (Not attached) 30

7 Exhibit 1013 (Not attached) 35

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

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

2 SAMUEL HARDIE RUSS, Ph.D.,

3 after having been first duly sworn by the certified
4 stenographer, was examined and testified as follows:

5 EXAMINATION

6 BY MR. CUVIELLO:

7 Q. Good morning, Dr. Russ. I'm
8 Mike CuvIELlo with Banner & Witcoff, and I
9 represent the Petitioner in this case, Comcast
10 Cable Communications.

11 You have already stated your name
12 and -- can you state your name and address for the
13 record?

14 A. Sure. My name is Samuel Hardie,
15 H-A-R-D-I-E, Russ, R-U-S-S. And did you say
16 address?

17 Q. Yes, please.

18 A. Okay. My address is 13712 Tom Gaston,
19 G-A-S-T-O-N, Road, Mobile, Alabama 36695.

20 Q. Great.

21 And can you tell me your current
22 location? Personal residence?

23 A. Personal residence, yes.

24 Q. Okay. And is anybody else there in the
25 room with you?

1 A. No.

2 Q. Okay. Is there anything that would
3 prevent you from providing truthful and accurate
4 testimony today?

5 A. Not that I'm aware of.

6 Q. Okay. Our court reporter already
7 covered some of this. But as you know, I will be
8 asking questions and you will be providing answers.

9 Do you understand that you're under
10 oath today -- in today's deposition, correct?

11 A. Yes.

12 Q. And you agree to provide verbal
13 answers, not merely nods of the head?

14 A. Yes.

15 Q. So if you answer your question --
16 answer to your question is "yes," you agree to say
17 "yes," and if it is "no," you agree to say "no"?

18 A. Okay.

19 Q. Okay. And unless you tell me
20 otherwise, I'm going to assume that you understand
21 and heard the question.

22 A. Yes.

23 Q. If there is anything that you don't
24 understand, just ask me to repeat the question.

25 A. Okay.

1 Q. I know you've been under depositions
2 before. But you understand that if your attorney
3 objects to the form of a question, you still have
4 to answer the question?

5 A. Yes.

6 Q. And we'll take breaks during the
7 deposition. If you need a break, just let me know.

8 A. Okay.

9 Q. If we're in the middle of a question,
10 I'll ask you to finish answering the question
11 before we do take a break.

12 A. All right.

13 Q. Okay. So you understand your
14 deposition today is regarding your declarations in
15 three IPR proceedings. Those are IPR 2024-00432,
16 224-00435 and 224-00438, correct?

17 A. Yes.

18 Q. And you understand one of the
19 proceedings involves US Patent 9,210,362?

20 A. Correct.

21 Q. And I'll refer to that as the
22 '362 patent. So will you understand if I say "the
23 '362 Patent," I'm talking about 9,210,362?

24 A. Yes.

25 Q. Great.

1 The second patent is US Patent
2 11,381,866. And I'll refer to that as "the
3 '866 Patent," correct?

4 A. Okay.

5 Q. And the third patent involves US Patent
6 11,399,206. And I'll refer to it as "the
7 '206 Patent."

8 A. Okay. Yes.

9 Q. All right. And so do you understand
10 that the '362, the '866 and '206 patents all share
11 the same drawings and specifications?

12 A. Yes.

13 Q. Okay. So primarily, I'll be referring
14 to the '362 Patent specification, but that will
15 apply to all three patents.

16 Do you have access to each paper and
17 exhibit in the IPR available?

18 A. I have paper copies of my three
19 declarations.

20 Q. Okay.

21 A. I have on my computer desktop, with
22 your permission, clean copies of the declarations,
23 the three patents and the Zhang reference.

24 Q. Okay. And that's everything you have?

25 A. That's everything I have, yes.

1 Q. No problem. If I want to refer to any
2 other references, what I will do is drop a copy in
3 the chatbox that you can then click and open. If
4 we need to refer to any other references.

5 A. Okay.

6 Q. And you just said they are clean
7 copies, so there's no markings or highlighting in
8 the copies?

9 A. Correct, yes.

10 Q. Okay. Great.

11 Okay. So, Dr. Russ, how did you first
12 become involved in this case?

13 A. Let's see. I was retained by counsel
14 on behalf of the patent owner, counsel representing
15 the patent owner.

16 Q. And which counsel is that?

17 A. I believe the firm's name is
18 Lowenstein & Weatherwax.

19 Q. Okay. And do you recall when they
20 reached out to you?

21 A. It was -- I believe it was sometime
22 calendar year 2024. I don't remember the details.

23 Q. Okay. And prior to this engagement,
24 have you worked for -- or with Entropic before?

25 A. I mean, short answer, no. The long

1 answer is also retained by K&L Gates in parallel
2 IPR matters for Entropic. But basically, before
3 being retained by the combination of K&L Gates and
4 Lowenstein & Weatherwax for the Entropic IPRs, no,
5 I was not, you know, engaged in any matters.

6 Q. Okay. And have you worked with
7 Lowenstein & Weatherwax before this engagement?

8 A. Not before these IPRs.

9 Q. Before this set of engagements, yeah.

10 A. Right. Not before this set of
11 engagements.

12 Q. And how many cases have you served as
13 an expert in?

14 A. Oh, 30 or 40. It's listed in my CV.

15 Q. And have those involved IPR proceedings
16 at the patent office for a petitioner?

17 A. Yes, I've done IPR work both for
18 petitioners and for respondents.

19 Q. And that's all in your CV?

20 A. Yes.

21 Q. Have you ever declined to be an expert
22 in any case?

23 A. Yes, I have.

24 Q. Can you tell me the technology area
25 that was involved?

1 A. You mean in terms of when I was -- when
2 I declined?

3 Q. Yes.

4 A. Well, you know, I don't remember the
5 specifics. You know, sometimes people will ask me
6 to be engaged in something that's outside of my
7 area of expertise. I don't know, like -- I don't
8 know, like chip fabrication or something, you know.
9 Other times, I've declined because of schedule.
10 Other times, I have declined because I thought I
11 didn't think it was the kind of case I wanted to be
12 involved in.

13 Q. Okay. And as far as technology goes,
14 chip fabrication is the only case you can recall
15 declining based on the technology involved?

16 A. And even that was an example. I don't
17 recall the specifics of the cases I declined.

18 Q. Okay.

19 Have you reviewed or were you aware of
20 these three patents, the '362, '866 and '206
21 patents, before this litigation occurred?

22 A. I was not.

23 Q. Okay. And you're being paid for your
24 work today, correct?

25 A. Yes.

1 Q. And what is your hourly rate?

2 A. My hourly rate is 450 per hour.

3 Q. Do you recall how much you've been paid
4 total to date?

5 A. No, I don't. I mean, I've worked a few
6 dozen to several dozen hours on this case, but I
7 don't have the specifics in hand.

8 Q. Okay. So how did you prepare for
9 today's deposition?

10 A. I read the -- my declarations, I read
11 the patents, I read the Zhang reference, and I
12 consulted with counsel. I may have read more
13 documents. I know I read at least those and I
14 consulted with counsel.

15 Q. When did you consult with counsel?

16 A. Over the last few days.

17 Q. And how long did you meet for?

18 A. I think probably three meetings, maybe
19 five to six hours each. Just rough estimate.

20 Q. Okay.

21 Okay. So let's switch over to your
22 declarations. You said you had copies of the
23 declarations in the three proceedings, the '362,
24 '866 and '206, correct?

25 A. That's correct.

1 Q. Yeah, they're all -- each labeled
2 Exhibit 2009?

3 A. They are.

4 Q. Okay. Just to keep things straight,
5 for your declaration in the '362 IPR, I'm going to
6 refer to it as the '362 declaration.

7 A. Sure.

8 Q. Is that clear?

9 A. Yeah.

10 Q. And for the '866 declaration and the
11 '206 declaration?

12 A. That makes sense, yes.

13 Q. Do you recall approximately how many
14 hours you worked on each declaration?

15 A. No. Like I said, I've worked a few
16 dozen to several dozen hours, and that's split
17 between the three declarations. You know, there's
18 some overlap between the three declarations. I
19 think it sort of natively arises from the fact that
20 the three patents have the same specification. But
21 it was several dozen to a few dozen hours
22 collectively over the three.

23 Q. Okay. And you reviewed the entirety of
24 each declaration before signing them, correct?

25 A. Yes. Definitely, yes.

1 Q. And did you discuss your declaration
2 with anybody other than counsel?

3 A. No.

4 Q. Who did most of the writing for your
5 declaration?

6 A. Well, let's see. Like most IPRs, you
7 know, clearly, there was some collaboration
8 involved. For example, the legal section, I call
9 it the legal boilerplate was drafted by counsel,
10 for example. You know, I drafted -- I would say I
11 drafted most of the declarations. And then counsel
12 and I worked collectively to edit and to
13 synchronize it with the -- the papers that the
14 attorneys filed.

15 Q. Were there portions of the declarations
16 that counsel drafted that you did not edit?

17 A. Not that I recall.

18 Q. And when did you begin preparing the
19 declarations?

20 A. Sometime in 2024. I don't remember,
21 you know. Clearly in the months before it was
22 filed, and I would have to -- sometime in 2024.

23 Q. Okay. And beyond the references that
24 you've already identified that you reviewed for
25 this deposition, what other materials did you

1 review in order to prepare the declarations and
2 arrive at your conclusions?

3 A. Prepare the declarations, you know, I
4 reviewed file history, I reviewed the deposition
5 testimony of Mr. Lett. I reviewed Mr. Lett's
6 declarations, the Petition, you know, materials
7 like that.

8 Q. Did you --

9 A. And I think those are listed in the
10 declaration.

11 Q. And you reviewed the entirety of each
12 of these documents?

13 A. Certainly the depositions and the
14 Petition, things like that. And, you know, I
15 reviewed the -- portions of the file history.

16 Q. So it's fair to say there are portions
17 of the references that you did not review?

18 A. Of the references? No, I reviewed the
19 references.

20 Q. Of the materials. Of the exhibits.

21 A. I mean, my recollection is I --

22 THE WITNESS: I'm sorry. Parm, did you
23 have an objection?

24 MR. HENDIFAR: Objection as to form.

25 Thank you.

1 BY MR. CUVIELLO:

2 Q. I'll move on.

3 Are there any materials that you
4 reviewed that are not identified in your
5 declarations?

6 A. I mean, not that I recall at the
7 moment, you know. I mean, for example, let's see,
8 on page 5 of the '362 declaration, I talk about the
9 prosecution history, the petition, the declaration,
10 the institution decision, and all the exhibits
11 cited in my declaration. So I certainly reviewed
12 all those.

13 Q. Okay. So let's move on to your
14 understanding of a person of ordinary skill in
15 the art.

16 A. Okay.

17 Q. For today's deposition, I'll refer to a
18 "POSITA" or a "POSA." Do those terms sound
19 familiar to you?

20 A. Yes.

21 Q. And you understand they refer to a
22 person of ordinary skill in the art at the time of
23 the invention of the '362, '866 and '206 patents,
24 correct?

25 A. Yes, correct.

1 Q. And do you also understand that the
2 time of the invention is the earliest priority date
3 for these patents?

4 A. Yes. And the way I worded it in
5 Paragraph 14 of my report is that it's -- as of the
6 time of the invention, which I understand is here,
7 seemed to be the effective filing date April 17th,
8 2009 provisional application, from which the
9 '362 Patent issued. So that's the date that I
10 assumed.

11 Q. Okay. Great. Thank you.

12 Referring to Paragraph 16 -- or 16
13 through 18 of your declaration. We'll refer to the
14 '362 declaration.

15 A. Sure.

16 Q. You say that you adopted Mr. Lett's
17 proposed level of skill in the art, correct?

18 A. Yes.

19 Q. And just to be clear, you did not
20 provide an opinion on a different level of ordinary
21 skill in the art other than the level stated by
22 Mr. Lett?

23 A. Right. I adopt -- I applied Mr. Lett's
24 proposed qualifications and then I note in
25 Paragraph 18: (Reading)

1 My opinions are valid even if
2 the Board adopts a slightly different
3 level of ordinary skill.

4 So that's the extent of what I did
5 here.

6 Q. Have you provided an opinion on what "a
7 slightly different level of ordinary skill" is in
8 your declarations?

9 A. No.

10 Q. So I want to move on to your
11 background. Just a little bit about your work
12 experience, specifically your time at Scientific
13 Atlanta and Cisco.

14 A. Okay.

15 Q. At Scientific Atlanta, or the
16 combination of Scientific Atlanta and Cisco, you
17 worked on set top boxes, correct?

18 A. That is correct.

19 Q. And this is in the 2007 time frame?

20 A. I would say the 2000 to 2007, yes.

21 Q. And the set top boxes you worked on,
22 were they capable of receiving cable television
23 signals?

24 A. Yes.

25 Q. And the set top boxes you worked on,

1 were they also capable of receiving satellite
2 television signals?

3 A. No.

4 Q. So you didn't work on any set top boxes
5 that were capable of receiving satellite
6 television?

7 A. I did not work on them. Now, I'm very
8 familiar with how those set tops work, but I did
9 not work on them.

10 Q. Would a cable -- would a set top box
11 that receives cable channels be able to receive
12 satellite channels?

13 MR. HENDIFAR: Objection, form.

14 THE WITNESS: Generally speaking, no.
15 Most set top boxes that I'm aware of are
16 purpose-built for one or the other.

17 BY MR. CUVIELLO:

18 Q. And the difference between the two has
19 to do with the frequency band in which the channels
20 are broadcast?

21 MR. HENDIFAR: Objection, form.

22 THE WITNESS: Well, the -- I mean,
23 there's more differences than that. There's
24 a lot of differences, but frequency band --
25 the frequency of transmission is different.

1 But there are other differences as well.

2 BY MR. CUVIELLO:

3 Q. Okay. Regarding the frequency of
4 transmission, do satellite systems have a wider
5 frequency band than cable systems?

6 MR. HENDIFAR: Objection, form.

7 THE WITNESS: I don't remember. I
8 don't recall the total band -- aggregate band
9 within the satellite system. It, obviously,
10 depends on the satellite system. I don't
11 recall.

12 BY MR. CUVIELLO:

13 Q. Okay. So let's move back to your
14 declaration. Well, not your declaration but your
15 CV.

16 You indicate that you authored a book
17 about signal integrity, correct?

18 A. That's correct.

19 Q. And this book is about applied
20 electromagnetics?

21 A. Among other things, yes. The way I
22 describe it is it's about designing circuit boards
23 for high-speed digital systems.

24 Q. Okay. And that book doesn't cover
25 signal processing, correct?

1 A. It does not, no. It's about the
2 circuit board layout techniques.

3 Q. Okay. Can you refer to Paragraph 5 of
4 your declaration? This is the '362 declaration.

5 A. Okay.

6 I see Paragraph 5 here.

7 Q. Okay. In that paragraph, you
8 reference -- you state that you authored a
9 reference textbook on signal processing. It's on
10 the third -- second and third line.

11 A. Oh. That, I think, is a typographical
12 error. I meant to say signal integrity.

13 Q. So you have never authored a book on
14 signal processing?

15 A. To the extent that signal integrity is
16 different than signal processing, yes.

17 Q. Okay. Thank you.

18 Okay. So I'd like to refer now to the
19 '362, '866 and '206 patents.

20 A. Okay.

21 Q. You have all three with you?

22 A. Yes, in electronic form.

23 Q. Okay. Great.

24 So refer to Figure 2 of the
25 '362 patent, please.

1 A. Okay.

2 Q. You recognize this figure?

3 A. Yes.

4 Q. Can you state what it is?

5 A. This is a wideband receiver system.

6 Q. Okay.

7 A. 200.

8 Q. And for reference, I'm generally
9 referring to Paragraph 32 of your declaration if
10 that helps.

11 A. Okay. Okay.

12 Q. Okay. Do you agree that Figure 2 is an
13 illustrative example of claims in the three
14 patents?

15 MR. HENDIFAR: Objection, form and
16 scope.

17 THE WITNESS: I'm sorry. Are you
18 quoting from something? It sounds like you
19 are.

20 BY MR. CUVIELLO:

21 Q. I'm asking is -- if it's your
22 understanding whether Figure 2 is an example of the
23 claims in the '362 Patent, the '206 Patent and the
24 '866 Patent?

25 MR. HENDIFAR: Objection, form and

1 scope.

2 THE WITNESS: Well, the claims are the
3 claims and the specifications are the
4 specifications. I certainly think the claims
5 are enabled by the specifications, including
6 the figures. You know, Figure 2 is a
7 preferred embodiment of the invention. You
8 know, I haven't performed an independent
9 analysis on the scope of Figure 2 versus the
10 scope of the claims.

11 BY MR. CUVIELLO:

12 Q. So is it your opinion here today that
13 the claims would be supported by Figure 2?

14 MR. HENDIFAR: Objection, form.

15 THE WITNESS: It sounds like --
16 "supported by" sounds like a legal term. I
17 think the claims are supported by the
18 specification, including the figures.

19 BY MR. CUVIELLO:

20 Q. Are the claims limited to Figure 2?

21 MR. HENDIFAR: Objection, form.

22 THE WITNESS: Well, I'm not an
23 attorney, but my recollection claims are not
24 limited to preferred embodiments.

25

1 BY MR. CUVIELLO:

2 Q. Okay. Can you refer to block 230 in
3 Figure 2.

4 A. Okay. I see that.

5 Q. This is referenced as the "digital
6 front end," correct?

7 A. Yes.

8 Q. Okay. Block 230 receives a digitized
9 input RF signal from the ADCs 1 and 2, correct?

10 A. That is correct, yes.

11 Q. Okay. And the signal that's output by
12 the ADCs includes a plurality of frequencies that
13 include desired and undesired channels, correct?

14 (Witness reviews document.)

15 Q. Again, I am referring to your
16 Paragraph 32 in your declaration.

17 A. Yeah, I believe the ADC outputs include
18 both desired and undesired channels.

19 Q. Okay. And it's your opinion that
20 block 230 selects and outputs the desired channels,
21 correct?

22 A. Let's see. Yes. (Reading)

23 Then a bank of end mixers,
24 blue, selects end desired channels
25 without selecting any undesired

1 channels from the digitized input RF
2 signals.

3 Q. Okay. So --

4 A. Continuing further down: (Reading)
5 The selected desired channels
6 are then output to demodulators.

7 And that's from Figure -- sorry,
8 Paragraph 32 of my '362 declaration.

9 Q. Okay. In block 230, there are a number
10 of signal paths that are included, correct?
11 Numbered 1 --

12 A. There are. I mean, there are signal
13 paths inside block 230, yes.

14 Q. Does each signal path include a
15 mixer 250?

16 A. Yes.

17 Q. And the outputs of the mixers are
18 identified as 252A to 252N, correct?

19 A. Correct. (Reading)

20 N frequency shifted desired
21 channels in the baseband.

22 Q. Okay. And it's your position that each
23 mixer 250 selects and outputs a different desired
24 channel without selecting an undesired channel,
25 correct?

1 A. Well, the mixers select the desired
2 channels from the digitized input signal. Each of
3 the end mixer paths is responsible for extracting a
4 desired channel from the digitized input signal.

5 Q. On the figure in Paragraph 32, you
6 label the boxes -- the mixers as "blue."

7 A. Yes.

8 Q. And you state: (Reading)

9 End mixers select end desired
10 channels without selecting any
11 undesired channels.

12 Is that statement correct?

13 A. Yes.

14 Q. And the channels selected from the
15 digitized input RF signal are output as channels
16 272A to 272N?

17 A. Well, I mean, they're eventually
18 output, you know, after going through the filter
19 and the decimator.

20 Q. Okay.

21 A. Yes.

22 Q. And those channels that are selected
23 from the digitized input RF signal, channels 272A
24 to 272N, they're output from a serial or parallel
25 interface, correct?

1 A. In Figure 2, yes, they are output --
2 272A to 272N are the end filtered and decimated
3 baseband channels. And yes, they're output over a
4 serial or parallel data interface to the modulator.

5 Q. Figure 2 uses the variable N, that's
6 capital N, as in November, to indicate the number
7 of paths included in block 230, correct?

8 A. Yes.

9 Q. You would agree that N could equal 1?

10 A. I guess I haven't -- I haven't
11 considered the scope of N.

12 Q. So are you saying you don't know?

13 A. No, I'm saying I haven't formed an
14 opinion.

15 Q. Would you agree that N could equal 2?

16 A. Again, I haven't formed an opinion on
17 the range of capital N.

18 Q. Okay.

19 MR. CUVIELLO: I'd like to take a
20 5-minute break, if that's okay with you guys.

21 (Recess taken from 10:38 a.m. to 10:45 a.m.)

22 BY MR. CUVIELLO:

23 Q. Dr. Russ, did you speak to anybody
24 during the break?

25 A. No, I did not.

1 Q. Great.

2 I'd like you to refer to the

3 '362 Patent, Column 6.

4 A. Okay.

5 Q. Lines 55 to 58.

6 A. Column 6, lines 55 through 58. Okay.

7 Q. Can you read that first sentence for
8 us?

9 A. (Reading)

10 The reduced sampling rate of
11 the N desired baseband channels will
12 be sent as a serial or parallel
13 digital data stream to a demodulator
14 using a serial or parallel data
15 interface according to commonly known
16 methods, as shown in Figure 2.

17 Q. This sentence refers to the serial or
18 parallel interface output from block 230 in
19 Figure 2, correct?

20 A. Yes, I believe so.

21 Q. In the parallel interface, each of the
22 plurality of channels that's output by 230 is
23 outputted on its own signal path, correct?

24 MR. HENDIFAR: Objection, scope.

25 THE WITNESS: It just says parallel --

1 it just says parallel data interface. It
2 doesn't say what that means.

3 BY MR. CUVIELLO:

4 Q. Do you understand what it means?

5 A. Yes, I understand what it means.

6 Q. Does it mean that each of the channels
7 is output on its own signal path?

8 MR. HENDIFAR: Objection, scope and
9 form.

10 THE WITNESS: It does not necessarily
11 mean that.

12 BY MR. CUVIELLO:

13 Q. Okay. With regard to the serial
14 interface, is each of the plurality of channels
15 output by 230 output on a single data path?

16 MR. HENDIFAR: Objection, scope.
17 I'm sorry.

18 THE WITNESS: Okay. The specification
19 is not clear.

20 BY MR. CUVIELLO:

21 Q. Okay. You already said that you don't
22 have any -- you don't have Exhibit 1016, do you?

23 A. Exhibit 1016. No, I don't.

24 Q. Okay. I'm going to share my screen.

25 A. Okay.

1 (Exhibit Number 1016 was marked for identification.)

2 MR. HENDIFAR: Would it be okay if I
3 drop Exhibit 1016 in the chatbox or you do so
4 Dr. Russ has access to it?

5 MR. CUVIELLO: Sure. I can do that.
6 It's a fairly large book.

7 MR. HENDIFAR: Dr. Russ, it is one of
8 the exhibits in the other folder so you may
9 already have it, if it's more convenient.

10 THE WITNESS: Oh. I can -- I can look.

11 MR. HENDIFAR: I'm sorry. I didn't
12 mean to interrupt. I just want to make sure.

13 MR. CUVIELLO: No, that's fine. And if
14 he has it, I will not drop it in the chatbox.

15 THE WITNESS: Let me check real quick.
16 I'm nearly certain that I do. Oh, yeah, I
17 have it here. Yes. So I'm going to transfer
18 it over to the folder I have for -- you know,
19 related to this deposition. So I have
20 Exhibit 1016 now and I am opening it. And I
21 have -- it's 140 pages. You know, the
22 exhibit is 140 pages.

23 BY MR. CUVIELLO:

24 Q. Yeah. And it's a book titled "Digital
25 Integrated Circuits," correct?

1 A. Yes, it's called Digital Integrated
2 Circuits, yes, that's right.

3 Q. Did you consider this exhibit when
4 forming your opinions?

5 A. Yes.

6 Q. Are you familiar with this textbook?

7 A. I mean, I was not familiar with it
8 before this case, but . . .

9 Q. Are you familiar with any of the
10 authors on the cover?

11 A. I've heard the name Rabaey, I think
12 somewhere before, but generally, no.

13 Q. Okay. Can you refer to page 80, that's
14 PDF page 80, native page 263.

15 A. Okay.

16 Q. At the top of this page, there's a
17 Figure 6-25. Do you see that?

18 A. I see that.

19 Q. And on the left, it shows an
20 illustration of a parallel interface, correct?

21 A. Yes.

22 Q. And on the right, it shows a picture of
23 a serial interface, correct?

24 A. Yes.

25 Q. You would agree that these are commonly

1 known structures for implementing serial and
2 parallel interfaces, correct?

3 A. Yes.

4 Q. Referring to the serial interface,
5 signals A and B enter on the left into a trapezoid,
6 correct?

7 A. Yes, a trapezoid, which is normally a
8 Figure 4 multiplexer, yes.

9 Q. And the same signals, A and B, exit
10 from other trapezoid on the right, correct?

11 A. Correct.

12 Q. And the trapezoid on the right is a
13 demultiplexer?

14 A. Yeah. I mean, that's one way to
15 describe it, yes.

16 Q. Okay. And the path between the
17 multiplexer and demultiplexer is a serial path
18 across which signals A and B are transmitted,
19 correct?

20 A. Correct.

21 Q. And the multiplexer on the left, that
22 selects which signal, A or B, to transmit on the
23 serial path at any particular time, correct?

24 MR. HENDIFAR: Objection, form.

25 THE WITNESS: In this figure as drawn,

1 that would appear to be the case. I'm trying
2 to find . . .

3 I mean, yeah. I'm sorry, can you,
4 please, repeat the question?

5 BY MR. CUVIELLO:

6 Q. In this figure of this serial interface
7 on the right, the multiplexer selects which signal,
8 A or B, to transmit on the serial path, correct?

9 MR. HENDIFAR: Objection, form.

10 THE WITNESS: I mean, yes. I would say
11 this is a very high-level drawing, but yes.

12 BY MR. CUVIELLO:

13 Q. Channels that are transmitted across
14 the serial path --

15 MR. HENDIFAR: I'm sorry. Could you
16 repeat the question? I couldn't hear you.

17 BY MR. CUVIELLO:

18 Q. Sorry. The channels that are
19 transmitted across the serial path are the same
20 channels originally selected from the plurality of
21 frequencies, correct?

22 MR. HENDIFAR: Objection, form and
23 scope.

24 THE WITNESS: Wait. I'm sorry. Are
25 you now talking about -- are you talking

1 about the textbook or are you talking about
2 the '362 Patent?

3 BY MR. CUVIELLO:

4 Q. I'm sorry. Yes, I switched to the
5 '362 Patent.

6 A. Okay. So -- so to be clear, we're
7 perhaps talking about Figure -- we're talking about
8 Figure 2 or --

9 Q. Figure 2.

10 A. Okay.

11 Q. The output of 230. Serial or parallel
12 data interface to the demodulator.

13 A. Okay.

14 Q. The channels 272A to 272N that are
15 output, this data interface.

16 A. Okay.

17 Q. They are the same channels that are
18 selected from the plurality of frequencies from the
19 input of the -- from the input of the 230?

20 MR. HENDIFAR: Objection, form.

21 THE WITNESS: Well, it says that they
22 are in filtered and decimated baseband
23 channels.

24 BY MR. CUVIELLO:

25 Q. And those channels originate from the

1 input signal that is -- enters 230?

2 MR. HENDIFAR: Objection, form.

3 BY MR. CUVIELLO:

4 Q. I'll rephrase the question.

5 The desired channels that are selected
6 from the digitized RF signal output by the ADC are
7 the same channels that are output from the data
8 interface as 272A to 272N, correct?

9 (Witness reviews document.)

10 A. I mean, yeah, I think that's correct.
11 Each signal path has an output and the outputs are,
12 yeah, 272A through 272N, yes.

13 Q. All right. I would like to switch over
14 to talking about Zhang, which is Exhibit 213.

15 A. Okay.

16 MR. HENDIFAR: 1013.

17 (Exhibit Number 1013 was marked for identification.)

18 BY MR. CUVIELLO:

19 Q. 1013, yes. Sorry.

20 I'll refer to this reference as
21 "Zhang." You'll understand that I'm referring to
22 2003-0056221?

23 A. Yes.

24 Q. All right. Did you review the entirety
25 of Zhang?

1 A. Yes, I did.

2 Q. Okay. Can you refer to Figure 2?

3 A. Okay.

4 Q. Referring to Paragraph 73 and 74 of
5 your '362 declaration, I'd like to just walk
6 through your understanding of how Zhang Figure 2
7 operates.

8 So to begin, an analog RF signal
9 received by the system on the left is processed by
10 a down-converter 210, correct?

11 A. Yes. The RF signal is processed by the
12 down-converter band filter 210, yes.

13 Q. And that analog signal includes a
14 frequency band that includes a plurality of desired
15 and undesired channels, correct?

16 (Witness reviews document.)

17 A. Yeah. Yes, it includes desired and
18 undesired channels.

19 Q. Okay. And down-converter 210, shifts
20 the frequency band including those channels to a
21 lower frequency --

22 A. Wait. I'm sorry, Counselor. I'm
23 thinking about my previous answer.

24 In the Zhang reference, it just says
25 that it's all channels. The desired and undesired

1 is a claim language, but the RF signal includes all
2 channels. And using the claim language of the --
3 say the '362, it includes desired and undesired
4 channels.

5 I'm sorry. Please repeat your
6 question.

7 Q. So the RF input to the converter
8 circuit on Figure 2 of Zhang includes the desired
9 and undesired channels, correct? And I'm referring
10 to Paragraph 33 of your declaration.

11 A. Oh, I thought you said Paragraph 74.

12 Q. That as well. But once --

13 A. Yes. Yes: (Reading)

14 Similar to the '362 Patent,
15 Zhang digitizes an input signal,
16 yellow, consisting of lower case N
17 channels, both desired and undesired,
18 in the analog to digital converter
19 220, yellow.

20 Yes, that's what I say in Paragraph 33.

21 Q. Okay. And what comes out of the
22 ADC 220 is a digitized version of the frequency
23 band from the analog signal, correct?

24 MR. HENDIFAR: Objection, form.

25

1 BY THE WITNESS:

2 Q. I'll rephrase and back up.

3 Down-converter 210 receives the RF
4 input and shifts the frequency band to a lower
5 frequency that can be sampled by ADC 220, correct?

6 A. Correct.

7 Q. And then ADC 220 digitizes that signal
8 to generate a digital version of the frequency
9 band, correct?

10 A. Yes. As I explain in Paragraph 74:
11 (Reading)

12 Zhang receives an RF input
13 signal, down-converts it in frequency
14 block down-converter 210 and digitizes
15 it in analog to digital converter 220.

16 Q. So the digitized signal that comes out
17 of the ADCs include a plurality of frequencies
18 including the desired and undesired channels,
19 correct?

20 A. Yes, the -- Zhang digitizes an input
21 signal consisting of N channels, both desired and
22 undesired, in the analog to digital converter 220.

23 So yes, and that's -- I'm reading that
24 from Paragraph 33 of my report.

25 Q. And that's the signal that's input to

1 demultiplexer 230?

2 A. Yes.

3 Q. And the digital demultiplexer 230 picks
4 out channels C1 through Cn from the plurality of
5 frequencies in the digitized RF signal, correct?

6 A. Right. It extracts all channels C1
7 through Cn and that's based on a quote from Zhang
8 in Paragraph 28.

9 Q. Okay. And each of C1 through Cn is
10 output on its own path, correct?

11 A. Yes, and you can see that in Figure 2.

12 Q. And this is because C1 through Cn are
13 now at baseband?

14 MR. HENDIFAR: Objection, form and
15 scope.

16 THE WITNESS: I don't know if it's
17 because they're at baseband, but all of the
18 channels in the plurality are processed by
19 the demux and output on separate signal
20 paths.

21 BY MR. CUVIELLO:

22 Q. So you do not know whether they are
23 baseband?

24 MR. HENDIFAR: Objection, form.

25 THE WITNESS: Your question was, are C1

1 through Cn output because they are at
2 baseband, and I'm saying they're output
3 because they're output.

4 BY MR. CUVIELLO:

5 Q. Are channels C1 through Cn at baseband?

6 A. Well, if we go ahead to Figure 3,
7 yes --

8 Q. Okay.

9 A. -- of Zhang, Figure 3 of Zhang.

10 Q. Does being at baseband mean they are
11 all at the same frequency? I'll rephrase.

12 Do channels C1 through Cn being at
13 baseband mean that they are all at the same
14 frequency?

15 MR. HENDIFAR: Objection, form.

16 THE WITNESS: It just means that
17 they've each been brought to baseband for
18 subsequent -- you know, for carrying out the
19 rest of Figure 2.

20 BY MR. CUVIELLO:

21 Q. I'll repeat the question. Does C1
22 through Cn -- I'll rephrase.

23 Does each signal, C1 through Cn, being
24 at baseband mean that they are all at the same
25 frequency?

1 MR. HENDIFAR: Objection, form, asked
2 and answered.

3 THE WITNESS: I mean, like I said, it
4 means they're each at baseband, and they're
5 put at baseband so that they can be -- you
6 know, so the remainder of the Figure 2 blocks
7 can carry out the functions indicated in
8 Figure 2.

9 BY MR. CUVIELLO:

10 Q. Is baseband of C1 the same baseband of
11 C2?

12 MR. HENDIFAR: Objection, form.

13 BY MR. CUVIELLO:

14 Q. Can you give me a verbal answer?

15 A. I'm considering your question,
16 Counselor.

17 Q. Okay.

18 A. I would just say that each of them is
19 at baseband.

20 Q. Do the outputs C1 through Cn include
21 the plurality of frequencies that are at the input
22 of the multiplexer 230?

23 MR. HENDIFAR: Objection, form.

24 THE WITNESS: I'm sorry, can you,
25 please, repeat the question?

1 BY MR. CUVIELLO:

2 Q. Do the outputs C1 through Cn include
3 the plurality of frequencies that are in the input
4 signal of multiplexer 230?

5 MR. HENDIFAR: Objection, form.

6 THE WITNESS: Well, they don't include
7 all the frequencies, but they are each a --
8 obtained from a subset of the frequencies.

9 BY MR. CUVIELLO:

10 Q. You agree that the input of the
11 multiplexer 230 includes a plurality of
12 frequencies, correct?

13 A. I'm sorry, Counselor, please, repeat
14 the question.

15 Q. You would agree that the input of
16 multiplexer 230 includes a plurality of
17 frequencies, correct?

18 A. Yes.

19 Q. And you would also agree that those
20 plurality of frequencies are not output on C1
21 through Cn, correct?

22 MR. HENDIFAR: Objection, form.

23 THE WITNESS: Well, the way I would
24 answer is with Paragraph 75 of my report,
25 that channels C1 through Cn are not the same

1 plurality of frequencies digitized by Zhang
2 in its analog digital converter 220, which in
3 Zhang's implementation is the entire input.
4 In Zhang, channel C1 through Cn together are
5 generally only a noncontiguous subset of the
6 digitized input signal.

7 BY MR. CUVIELLO:

8 Q. You agree that C1 through Cn, each of
9 those signals is at baseband, correct?

10 A. Let me -- let's see. Well, it says in
11 some -- and I'm reading Zhang now, so a more
12 accurate answer in Paragraph 32: (Reading)

13 In some embodiments of the
14 present invention, the target RF
15 channel is shifted to a baseband.

16 So in some embodiments, each RF channel
17 is at baseband.

18 Q. Okay. Is baseband a frequency at the
19 input of digital channel demultiplexer 230?

20 MR. HENDIFAR: Objection to form.

21 THE WITNESS: I mean, I'm not sure how
22 to answer your question because it depends,
23 you know, if the -- it just depends. I mean,
24 there's not a straightforward answer to that.
25 I know that in some embodiments in Zhang, C1

1 through -- each of the C1 through Cn is at
2 baseband and then -- but Figure 3, you know,
3 shows how that processing occurs.

4 BY MR. CUVIELLO:

5 Q. Is C1 at the same frequency as it was
6 at, at the input of the demultiplexer 230?

7 MR. HENDIFAR: Objection, form.

8 THE WITNESS: I mean, it's been
9 processed as shown in Figure 3. So it's --
10 let me read what Zhang has to say about it.
11 (Reading)

12 When a multichannel RF signal
13 is multiplied with the output of the
14 numerically controlled oscillator 310,
15 the frequency of target RF channel
16 signal is shifted to a desired
17 channel. In some embodiments in the
18 present invention, the target RF
19 channel is shifted to a baseband.

20 So internal -- circuits that are
21 internal to the digital channel demux 230, for
22 example, as shown in Figure 3 of Zhang, do
23 perform a frequency-shifting function and so
24 that the -- you know, each of the C1 through
25 Cn channels that come in are -- each frequency

1 shifted inside the digital channel demux.

2 BY MR. CUVIELLO:

3 Q. So channel C1 through Cn are no longer
4 at the frequencies they were at the input of
5 Figure 3?

6 A. That's correct.

7 Q. Okay. Now that we're on to Figure 3.
8 So you stated that Figure 3 is example of 230 in
9 Figure 2?

10 A. Let's see. Zhang says in Paragraph 30:
11 (Reading)

12 Figure 3 is a simplified
13 high-level schematic diagram of a
14 digital tuner 300, which in some
15 embodiments of the present invention
16 can be used to implement digital
17 channel demultiplexer 230 of Figure 2.

18 Yes.

19 Q. And so the signal input from the left
20 includes the desired and undesired channels in
21 multiple frequencies, correct?

22 A. Yeah. The way Zhang puts it, it
23 includes all channels. And as I explain in my
24 report, that means it's both desired and undesired.

25 Q. Okay. And that signal is input to end

1 chains of identical circuits?

2 A. Yes, that's one way to -- that is a
3 fair way to characterize it, yes.

4 Q. Okay. So each chain includes a complex
5 multiplexer 320, a numeric-controlled oscillator
6 310?

7 A. I'm sorry. I'm sorry, Counselor, I
8 apologize. A complex multiplier 320.

9 Q. Multiplier. Okay.
10 Complex multiplier 320, a
11 numeric-controlled oscillator 310 and a low-pass
12 filter 330, correct?

13 A. Yes, that's what is shown in Figure 2.

14 Q. And each of 310, 320 and 330 in the
15 same chain are identified with the same index
16 number, which is 1 through little N, correct?

17 A. Correct.

18 Q. So 310, 320 and 330 identified with
19 index 1 are in the first chain?

20 A. Correct.

21 MR. HENDIFAR: I'm so sorry. There was
22 a small disconnect on our end. If you could,
23 please, repeat the last question.

24 BY MR. CUVIELLO:

25 Q. 310, 320 and 330 identified with

1 index 1 are in the first chain, correct?

2 A. Yes, and that's what's used to create
3 channel C1, yes.

4 Q. Okay. And 310, 320 and 330 identified
5 with an index N are in the last chain?

6 A. Correct, and they produce channel Cn.

7 Q. So it's your understanding that each
8 chain extracts one of the channels C1 through Cn,
9 correct?

10 A. Yes.

11 Q. Okay. So I'd like to walk through one
12 chain now.

13 A. Okay.

14 Q. For index 1 for example, in this chain
15 the numeric-controlled oscillator 310 is controlled
16 to output a select frequency, correct?

17 A. Correct.

18 Q. And that frequency matches a target
19 channel in the multichannel digital RF signal
20 input, correct?

21 A. Yes, and this is tracking Paragraph 32
22 of Zhang, yes.

23 Q. The select frequency is then multiplied
24 by the multichannel digital RF signal by the
25 complex multiplier, correct, 320?

1 A. Yes.

2 Q. And then the multiplexer then outputs
3 the target channel but shifted to baseband,
4 correct?

5 A. I'm sorry. To be clear, the multiplier
6 outputs.

7 Q. I'll rephrase.

8 The multiplier then outputs to target
9 channel but shifted the baseband, correct?

10 A. Well, it says shifted to a desired
11 channel and then in some embodiments, the target RF
12 channel is shifted to a baseband, i.e., centered at
13 DC.

14 Q. Okay. And finally, the low-pass filter
15 blocks all other channels and only passes the
16 target channel?

17 A. Right. They each filter out all RF
18 channels except for its target RF channel. Thus,
19 only the target RF channel passes.

20 And again, that's Paragraph 32 of
21 Zhang, for the record.

22 Q. Can we scroll down to Claim 21.

23 MR. HENDIFAR: Of?

24 BY MR. CUVIELLO:

25 Q. Of Zhang, which is on page 5 in the

1 right-hand column.

2 A. Okay.

3 Q. Claim 21 is directed to a digital
4 tuner, correct?

5 A. Yes.

6 Q. So the digital tuner -- you can take a
7 second to read through it if you would like.

8 (Witness reviews document.)

9 A. Okay.

10 Q. Okay. So the digital tuner in Claim 21
11 includes three elements, correct?

12 A. Yes. A numeric-controlled oscillator,
13 a complex multiplier and a low-pass filter.

14 Q. And the first element, the at least one
15 numeric-controlled oscillator, that corresponds to
16 referring back to Figure 3, the numeric-controlled
17 oscillator 310, correct?

18 A. It can, yes.

19 Q. And the complex multiplier -- sorry.
20 The at least one complex multiplier corresponds to
21 complex multiplier 320 in Figure 3, correct?

22 A. It can, yes, correct.

23 Q. And the at least one low-pass filter in
24 Claim 21 corresponds to low-pass filter 330 in
25 Figure 3, correct?

1 A. Correct.

2 Q. So you would agree that the
3 multichannel digital RF signal in Claim 21
4 corresponds to the multichannel's digital RF signal
5 that's input to Figure 33, correct?

6 A. I mean, it can. You know, I haven't
7 opined on the scope of Claim 21 versus the scope of
8 the Figure 3 disclosure. But it can.

9 Well, let me -- actually, let me
10 rephrase that. I don't know. I haven't performed
11 a detailed analysis of what the scope of Claim 21
12 is. I don't -- I don't have an opinion on that
13 because I haven't looked at Claim 21 in detail.

14 Q. Looking at it now, can you consider
15 that analysis?

16 A. I mean, it would take time and study to
17 make that analysis. I mean, it's not something I'm
18 basing an opinion on, and it's not something I'm
19 prepared to issue an opinion on at the moment. I
20 would have to study the reference and the claims in
21 considerable detail to form an opinion on that.

22 Q. Okay. Previously you indicated that
23 you reviewed all of Zhang. Did that not include
24 Claim 21?

25 A. It did include Claim 21, but I haven't

1 performed any detailed analysis on the extent to
2 which Claim 21 lines up with disclosure in Figure 3
3 or with the specification in general.

4 MR. CUVIELLO: Why don't we take
5 another break.

6 MR. HENDIFAR: Okay.

7 (Recess taken from 11:20 a.m. to 11:30 a.m.)

8 BY MR. CUVIELLO:

9 Q. Okay. Dr. Russ, I would like to go
10 back to discussing Figure 2 of Zhang.

11 A. Okay.

12 Q. We talked about channels C1 through Cn
13 being output by demultiplexer 230. These channels
14 are then input to selector 240, correct?

15 A. Correct.

16 Q. Okay. Can you now refer to Figure 5 of
17 Zhang?

18 A. Okay.

19 Q. The circuit in Figure 5 is an example
20 of selector 240 in Figure 2, correct?

21 A. Let's see what Zhang says.

22 Q. Paragraph 66 of your declaration covers
23 this.

24 (Witness reviews document.)

25 A. Okay. I see that.

1 Q. Okay. In channel -- in Figure 5,
2 channel C1 through Cn illustrated entering the bus
3 selector 510 on the left side of the circuit,
4 correct?

5 A. Correct.

6 Q. It is your understanding that bus
7 selector 510 passes some of the channel C1 to Cn to
8 databuses 1 through K?

9 A. Correct. That's what Figure 5 seems to
10 show, yes.

11 Q. There's only a single databus.
12 Multiple channels from C1 to Cn are passed across
13 it serially, correct?

14 A. Well, the -- I'm not sure. All we know
15 is that databus 1, for example, carries channels D1
16 through Dm in a time division multiplex manner. I
17 don't know that databus 1 is serial.

18 Q. Does a serial interface carry data in a
19 time division manner?

20 MR. HENDIFAR: Objection, form.

21 THE WITNESS: Those are some very broad
22 terms. I mean, it depends on the context.

23 BY MR. CUVIELLO:

24 Q. Can a serial bus carry data other than
25 in a time division manner?

1 MR. HENDIFAR: Objection, form.

2 THE WITNESS: It depends on the
3 context.

4 BY MR. CUVIELLO:

5 Q. In this context.

6 MR. HENDIFAR: Objection, form.

7 THE WITNESS: It depends on the serial
8 bus, it depends on the data, it depends on a
9 lot of things.

10 BY MR. CUVIELLO:

11 Q. So sitting here today, you don't
12 have -- you don't know if databus 1 is a serial
13 databus?

14 A. Well, let's see what Zhang says. Let's
15 see. Paragraph 38: (Reading)

16 Digital selector 500 includes
17 a bus selector 510, one or more
18 multiple databuses 520 in time
19 division multiplexer 530.

20 So it just says that databus 520 is a
21 databus. It doesn't say that it's serial. It just
22 says that it's a databus.

23 Q. You agree that data is transmitted over
24 databus 1 in a time division multiplex manner?

25 A. That appears to be the case because,

1 you know, it's subsequently demultiplexed by time
2 division demultiplexer 530. So it looks like the
3 databus is carrying data that is time division
4 multiplexed.

5 Q. And time division multiplexer 530
6 outputs the channels transmitted over the databus
7 as D1 through Dm, correct?

8 A. That appears to be what's going on in
9 the figure, yes.

10 Q. So you would agree that D1 through Dm
11 are the same as a subset of channels C1 through Cn
12 selected by 240, correct? Selected by 510,
13 correct? Sorry, I'll rephrase that.

14 You would agree that D1 through Dm are
15 the same as a subset of channels C1 through Cn
16 selected by bus selector 510?

17 MR. HENDIFAR: Objection, form.

18 THE WITNESS: Well, let's see. It
19 looks like I quote Zhang Paragraph 39 in
20 Paragraph 67 of my declaration. And again,
21 this is the '362 declaration. Let's see:

22 (Reading)

23 The digital selector in
24 Figure 5 selects one or more RF
25 channels D1 through Dm from the

1 digital RF channels C1 to Cn and then
2 sends them to appropriate demodulators
3 or output ports.

4 So the RF channels D1 to Dm are selected
5 from digital RF channels C1 to Cn. Yeah, so
6 D1 to Dm are selected from C1 to Cn.

7 BY MR. CUVIELLO:

8 Q. So D1 through Dm are the same channels
9 as a subset of channels C1 through Cn?

10 A. I mean, they -- they are selected from
11 C1 to Cn.

12 Q. So is that, yes, they are the same as a
13 subset of D1 -- or C1 through Cn?

14 A. I'm not sure what you -- well, the --
15 Zhang doesn't describe them as a subset. It just
16 says that they are selected from.

17 Q. Can bus selector 510 select C1, for
18 example?

19 MR. HENDIFAR: Objection, form and
20 scope.

21 THE WITNESS: Since D1 to Dm are
22 selected from the digital RF channel C1 to
23 Cn, Cn1 is a candidate for selection.

24 BY MR. CUVIELLO:

25 Q. And if C1 is selected by bus selector

1 510, it would be output as one of D1 through Dm,
2 correct?

3 MR. HENDIFAR: Objection, form.

4 (Witness reviews document.)

5 THE WITNESS: Well, it would -- I mean,
6 I think what I said before is correct. C1 is
7 a candidate for selection. And once
8 selected, it becomes -- it becomes mapped to
9 one of the D channels.

10 BY MR. CUVIELLO:

11 Q. So you would agree that D1 through Dm
12 originate from the same source as C1 through Cn,
13 correct?

14 MR. HENDIFAR: Objection, form.

15 THE WITNESS: No. D1 through Dm
16 originate from C1 through Cn. C1 through Cn
17 originate from the digitizer.

18 BY MR. CUVIELLO:

19 Q. In your previous answer, you stated
20 that C1, once selected, it becomes mapped to one of
21 the D channels.

22 MR. HENDIFAR: Objection, form.

23 BY MR. CUVIELLO:

24 Q. Are you saying there's a difference
25 between C1 when it enters bus selector 510 and the

1 channel it's mapped to when it leaves time division
2 demultiplexer 500?

3 MR. HENDIFAR: Objection, form.

4 THE WITNESS: Well, the C's are all of
5 the input channels. There's no selection
6 performed on them. The D's are selected. So
7 there's definitely a difference. And Zhang
8 clearly discloses that.

9 BY MR. CUVIELLO:

10 Q. Sorry. That wasn't my question.

11 A. If there was no difference, there would
12 be no need for this entire functional block. They
13 are certainly different.

14 Q. You would agree that C1, if selected,
15 could be output as D1, correct?

16 A. Well, again, there's more to it than
17 that. I mean, C1 is one of all possible channels.
18 And once it becomes selected, it gets mapped to one
19 or more of the D's. The D's are selected channels.
20 And, you know, like Paragraph 28 of Zhang makes
21 that clear. And so in traveling through the -- let
22 me -- with reference to Zhang.

23 In traveling through the N by M
24 selector 240, you know, there's a mapping that
25 occurs. And so the C's are mapped to D's. And

1 that's the whole point, is that they're selected.

2 Q. Okay. So when they are mapped -- I'll
3 rephrase my question.

4 If C1 is selected -- you agree that C1
5 can be selected by bus selector 510, correct?

6 A. C1 can be selected and output on one of
7 the D's, at which point, it has been mapped and is
8 no longer C, it is now a D. But yes, it can be
9 selected.

10 Q. So it's your opinion here today that it
11 is different because it has a different label,
12 because it's labeled D as opposed to C?

13 MR. HENDIFAR: Objection, form.

14 THE WITNESS: Different because it's
15 been selected by the -- sorry. It's been
16 selected by the N by M selector 240.

17 BY MR. CUVIELLO:

18 Q. You would agree that there's no
19 difference in the data in C1 when selected and
20 mapped to D1, correct?

21 A. Well, I haven't, you know, issued an
22 opinion on that, but the mapping from C to D is
23 significant. One is an unselected, you know,
24 channel. The other is a selected channel, in the
25 language of Zhang.

1 Q. Does the selection -- the selection
2 doesn't change the data in the channel, though,
3 correct?

4 A. I mean, the selection doesn't change
5 the data in the channel, but it definitely changes
6 it from one of all channels to a selected channel.

7 Q. Okay. So a selected channel could be
8 any subset of C1 through Cn?

9 A. In Zhang, the -- again, the C1 through
10 Cn's are all channels. And after going through the
11 N by M selector, the selected channels come out.
12 They are selected from the C1 through Cn. And so
13 the D1's through Dm's are the selected versions of
14 the unselected channels coming in.

15 Q. Okay. And you would agree that D1
16 through Dm don't originate from any other source
17 than C1 through Cn, correct?

18 A. The -- right, the input to the selector
19 is C1 through Cn and the output is D1 through Dm.

20 Q. So D1 through Dm have to be one of C1
21 through Cn?

22 A. Right, D1 through Dm's are selected
23 from -- or the way Zhang explains it, and I quote
24 it in my report: (Reading)

25 The digital selector selects

1 one or more RF channels D1 to Dm from
2 the digital RF channels C1 through Cn,
3 and then send them to appropriate
4 demodulators or output ports.

5 And that's Zhang Paragraph 39 quoted in
6 Paragraph 67 of my '362 declaration.

7 Q. So if D1 through Dm are from C1 through
8 Cn, they must be from the same source as C1 through
9 Cn, correct?

10 A. I mean -- no. I mean, Figure 2 makes
11 clear that the D1 through Dm are selected from C1
12 through Cn. And C1 through Cn are created from the
13 input to digital channel demux 230. I mean, the
14 inputs and outputs of these different -- the
15 different devices shown in Figure 2, I mean, they
16 have different inputs and outputs. And they're
17 arranged in series for a reason.

18 And to be clear, I think my report
19 makes that clear.

20 Q. So it's your opinion here today that D1
21 through Dm are not from the same source as C1
22 through Cn?

23 MR. HENDIFAR: Objection, form.

24 THE WITNESS: Well, for example,
25 Paragraph 70 of my report: (Reading)

1 To the extent Petitioner
2 relies on channels D1 through Dm as to
3 claim plurality of desired television
4 channels, that reliance fails to
5 disclose or render obvious to claims
6 because D1 through Dm are not selected
7 from the same plurality of frequencies
8 down-converted and digitized in
9 limitations 1B and 1C as required.

10 And the, you know, declaration goes on
11 from there to explain in detail what I mean by
12 that.

13 BY MR. CUVIELLO:

14 Q. So the data in D1 through Dm, you would
15 agree that they are from the plurality of
16 frequencies even if they're not selected from them?

17 MR. HENDIFAR: Objection, form.

18 BY MR. CUVIELLO:

19 Q. I'll rephrase.

20 Is the data in D1 through Dm also in
21 the plurality of frequencies that are input to --
22 sorry, into demultiplexer 230?

23 A. I mean, as I explain in Paragraph 70 of
24 my report, channels D1 through Dm are not selected,
25 open quote, from, close quote, the same, open

1 quote, plurality of frequencies, close quote,
2 down-converted and digitized in limitations 1B and
3 1C as required, so --

4 Q. I appreciate that answer. My question,
5 however, is the data in D1 -- I'll rephrase.

6 Does the data in D1 originate in the
7 plurality of frequencies input to digital channel
8 demultiplexer 230?

9 A. Well, the data in D1 through Dm are
10 selected from channels C1 through Cn. That's where
11 the data comes from.

12 Q. "Yes" or "no," does the data through D1
13 through Dm originate in the plurality of
14 frequencies input to multiplexer 230?

15 MR. HENDIFAR: Objection, asked and
16 answered.

17 THE WITNESS: Because the data -- the
18 channels D1 through Dm originate from C1
19 through Cn, I believe the answer is no. But
20 the important thing is that D1 through Dm
21 come from C1 through Cn and not the input to
22 the digital channel demux.

23 BY MR. CUVIELLO:

24 Q. Okay. So it's your position today that
25 the data in D1 through Dm is not in the plurality

1 of frequencies in digital channel demux 230?

2 MR. HENDIFAR: Objection to form.

3 THE WITNESS: Okay. I was asked to
4 respond to -- I was asked to analyze, you
5 know, a petition and a Petitioner's
6 declaration and form opinions in response to
7 that. My opinion is that channels D1 through
8 Dm are not selected from the same plurality
9 of frequencies down-converted and digitized
10 in limitations 1B and 1C as required.

11 BY MR. CUVIELLO:

12 Q. Okay. So sitting here today, you do
13 not have an opinion as to whether the data in D1
14 through Dm originate from the input to digital
15 channel demultiplexer 230?

16 MR. HENDIFAR: Objection, form.

17 THE WITNESS: My opinion is that it
18 does not. It originates from channel C1
19 through Cn, which are not the same as the
20 plurality of frequencies as explained, for
21 example, in Paragraph 75. Channels C1
22 through Cn together are generally only a
23 noncontiguous subset of the digitized input
24 signal. And I go on to explain more in
25 Paragraph 75 of my '362 declaration.

1 BY MR. CUVIELLO:

2 Q. Okay. I'll be more precise with my
3 previous question. Is it your -- is it your
4 opinion that the data in D1 through Dm is not
5 present in the signal input to demultiplexer 230?

6 A. Well, what I said is that it is not the
7 same plurality of frequencies. So it's -- you
8 know, it's selected from a different source because
9 C1 through Cn are a subset of the plurality of
10 frequencies for reasons explained in Paragraph 75.

11 Q. So plurality of frequencies wasn't in
12 my previous question. The question was, is it your
13 opinion that the data in D1 through Dm is not
14 present in this signal input to demultiplexer 230?

15 MR. HENDIFAR: Objection, form.

16 THE WITNESS: Well, I -- the way your
17 question is phrased, as I understand your
18 question, you know, I haven't performed an
19 analysis on all the possible ways that the
20 inputs D1 through Dm can be interpreted
21 because I'm responding to a positive mapping
22 of Zhang to the claims of the '362 patent.

23 Now, the opinion that I do express in
24 this report is that there's a definite
25 difference between C1 through Cn on one hand

1 and the plurality of frequencies on the other.
2 So I'm saying that the D1 through Dm are
3 selected from C1 through Cn and not the
4 plurality of frequencies coming into digital
5 channel demux 230.

6 BY MR. CUVIELLO:

7 Q. So assume C1 is selected as D1, do C1
8 and D1 include the same data?

9 A. Well, C1 in that scenario, on one hand,
10 C1 and D1 might contain the same data, but they're
11 definitely distinct. One is mapped -- sorry. One
12 is selected and one is not. The D represents a
13 channel that's been selected and the C's represent
14 channels that are not selected.

15 Q. So I'm not talking about -- I'm not
16 talking about all the channels. I'm talking about
17 C1. When it is selected as D1, do they contain the
18 same data?

19 A. C1 and D1 -- if D1 -- sorry. If C1 is
20 selected and mapped onto D1, they would contain the
21 same data. But again, the D's represent selected
22 signals and the C represent unselected signals. So
23 while the data may be the same, the -- the
24 significance of the C and D are different.

25 MR. CUVIELLO: Why don't we take one

1 more break at this point.

2 MR. HENDIFAR: Let's come back maybe
3 five minutes. Five minutes past the hour if
4 that's okay with everyone.

5 (Recess taken from 11:55 p.m. to 12:05 p.m.)

6 BY MR. CUVIELLO:

7 Q. Dr. Russ, did you talk to anybody
8 during the break?

9 A. No, I did not.

10 Q. And I forgot to ask, in the previous
11 break, did you talk to anybody?

12 A. No, I did not.

13 Q. Okay. Great.

14 I want to walk through Figure 2 one
15 more time to make sure that I understand your
16 testimony completely.

17 A. To be clear, Figure 2 of Zhang, right?

18 Q. Figure 2 of Zhang, yes. Sorry.

19 A. Okay.

20 Q. Okay. So just, again, starting on the
21 left of the figure, starting at the output of
22 ADC 220.

23 A. Okay.

24 Q. It outputs a digitized RF signal,
25 correct?

1 A. Right, a down-converted and digitized
2 plurality of frequencies.

3 Q. And each of those frequencies includes
4 a different channel, desired or undesired, correct?

5 MR. HENDIFAR: Objection, form and
6 scope.

7 THE WITNESS: Well, the way I would put
8 it is that the -- all channels, desired or
9 undesired, are then extracted from the
10 plurality of frequencies.

11 BY MR. CUVIELLO:

12 Q. Okay. So one of those channels is
13 extracted and output on C1, correct?

14 A. Correct.

15 Q. So the data in C1 is the same data that
16 was in one of the plurality of frequencies at the
17 input of 230, correct?

18 A. Well, C1 is a frequency shifted version
19 of, yeah, the -- where one of plurality of
20 frequencies that came in, yes. A part of the
21 plurality of frequencies that came in, yes.

22 Q. Okay. So just so I get a clean answer,
23 the data in C1 is the same data that was in one of
24 the plurality of frequencies at the input of 230,
25 correct?

1 A. Well, I guess I'm struggling because I
2 don't know what you mean by "the data in C1."

3 Q. Are you saying you don't understand the
4 data -- that C1 includes data?

5 A. I certainly understand that. I'm
6 trying to understand your question.

7 Q. C1 includes data, correct?

8 A. Well --

9 Q. "Yes" or "no"?

10 A. C1 -- okay. Hold on. C1 has -- C1 is
11 a digital representation of a waveform and -- it is
12 a digital representation of a waveform.

13 Q. Okay. And that waveform is selected
14 from a plurality of frequencies at the input of
15 demultiplexer 230, correct?

16 A. That waveform is a frequency -- yeah.
17 I mean, the short answer is yes. But to be clear,
18 it's a -- it's a frequency-shifted version of the
19 signal that came in and is part of the plurality of
20 frequencies that came in.

21 Q. Okay. Now let's assume that C1 is
22 selected by 240 to be output by D1. You agree
23 that's a possibility, correct?

24 A. Yes, D1 can be -- is selected from C1
25 through Cn, and C1 is a possibility. So again,

1 the -- with, again, the C being the unselected
2 version and D being the selected version, yes.

3 Q. Okay. So under this assumption, you
4 would agree that the frequency-shifted version of
5 the signal that's on C1 is output on D1, correct?

6 A. Correct. Again, with the important
7 note that D is the selected version and C is the
8 unselected version, which Zhang makes clear. In
9 fact, that's the whole purpose of block 240.

10 MR. CUVIELLO: Okay. I think we have
11 no further questions.

12 MR. HENDIFAR: We have no redirect. So
13 I think -- thank you very much.

14 MR. CUVIELLO: Thank you.

15 (Discussion held off the record.)

16 (Signature waived.)

17 (Deposition concluded at 12:10 p.m.)

18 - - -

19

20

21

22

23

24

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

CERTIFICATE OF NOTARY PUBLIC

I, Amy A. Brauser, RPR RMR CRR, the officer before whom the foregoing deposition was taken, do hereby certify that the witness was duly sworn by me prior to the taking of the foregoing deposition; that the testimony of said witness was taken by me to the best of my ability and thereafter reduced to typewriting under my direction; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this deposition was taken, and further that I am not a relative or employee of any attorney or counsel employed by the parties thereto, nor financially or otherwise interested in the outcome of the action.

This is the 25th day of March, 2025.

Amy A. Brauser

Amy A. Brauser, RPR RMR CRR

Notary Public

for the Commonwealth of Virginia

Notary Registration No.: 7675529

My Commission Expires: January 31, 2028



Magna

Key Contacts

Schedule a Deposition:

Scheduling@MagnaLS.com | 866-624-6221

Order a Transcript:

CustomerService@MagnaLS.com | 866-624-6221

General Billing Inquiries:

ARTeam@MagnaLS.com | 866-624-6221

Scheduling Operations Manager:

Patricia Gondor (E: PGondor@MagnaLS.com | C: 215-221-9566)

Customer Care:

Cari Hartley (E: CHartley@MagnaLS.com | C: 843-814-0841)

Director of Production Services:

Ron Hickman (E: RHickman@MagnaLS.com | C: 215-982-0810)

National Director of Discovery Support Services:

Carmella Mazza (E: CMazza@MagnaLS.com | C: 856-495-1920)

Billing Manager:

Maria Capetola (E: MCapetola@MagnaLS.com | C: 215-292-9603)

Director of Sales Operations:

Kristina Moukina (E: KMoukina@MagnaLS.com | C: 215-796-5028)

A			
ability 70:8 able 19:11 access 8:16 30:4 accurate 6:3 43:12 action 70:11,15 ADC 24:17 35:6 37:22 38:5,7 66:22 ADCs 24:9,12 38:17 address 5:12,16,18 adopt 17:23 adopted 17:16 adopts 18:2 aggregate 20:8 agree 6:12,16,17 22:12 27:9,15 31:25 42:10 42:15,19 43:8 50:2 53:23 54:10,14 56:11 57:14 58:4,18 59:15 61:15 68:22 69:4 ahead 40:6 Alabama 5:19 Amy 3:3 70:3,20 analog 36:8,13 37:18,23 38:15,22 43:2 analysis 23:9 50:11,15,17	51:1 64:19 analyze 63:4 answer 6:15,16 7:4 9:25 10:1 36:23 41:14 42:24 43:12,22,24 56:19 62:4,19 67:22 68:17 answered 41:2 62:16 answering 7:10 answers 6:8,13 anybody 5:24 14:2 27:23 66:7 66:11 apologize 46:8 APPEAL 1:1 appear 33:1 APPEARANCES 2:1 appears 53:25 54:8 application 17:8 applied 17:23 20:19 apply 8:15 appreciate 62:4 appropriate 55:2 60:3 approximately 13:13 April 17:7 area 10:24 11:7 arises 13:19 arranged	60:17 arrive 15:2 art 16:15,22 17:17,21 asked 41:1 62:15 63:3,4 asking 6:8 22:21 assume 6:20 65:7 68:21 assumed 17:10 assumption 69:3 Atlanta 18:13,15,16 attached 4:6,7 attorney 7:2 23:23 70:13 attorneys 14:14 authored 20:16 21:8,13 authors 31:10 available 8:17 aware 6:5 11:19 19:15 a.m 1:18 3:6 27:21,21 51:7,7	38:4,9 bank 24:23 Banner 2:5 5:8 baseband 25:21 27:3 28:11 34:22 39:13,17,23 40:2,5,10,13,17,24 41:4,5,10,10,19 43:9,15,17,18 44:2 44:19 48:3,9,12 based 11:15 39:7 basically 10:2 basing 50:18 behalf 2:2,9 3:2 9:14 believe 9:17,21 24:17 28:20 62:19 best 70:8 beyond 14:23 bit 18:11 block 24:2,8,20 25:9,13 27:7 28:18 38:14 57:12 69:9 blocks 41:6 48:15 blue 24:24 26:6 board 1:1 18:2 21:2 boards 20:22 boilerplate 14:9 book 20:16,19,24 21:13 30:6,24
		B	
		B 32:5,9,18,22 33:8 back 20:13 38:2 49:16 51:10 66:2 background 18:11 band 19:19,24 20:5,8,8 36:12,14,20 37:23	

Boulevard 2:11	capital 27:6,17	62:7,22 63:1,15,18 65:5,13 67:4	23:13,17,20,23 50:20 61:5 64:22
box 19:10	carries 52:15	channels 19:11,12,19 24:13,18 24:20,24 25:1,5,21 26:2,10,11,14,15,22 26:23 27:3 28:11,22 29:6,14 33:13,18,20 34:14,17,23,25 35:5 35:7 36:15,18,20,25 37:2,4,9,17 38:18 38:21 39:4,6,18 40:5,12 42:25 44:25 45:20,23 47:8 48:15 48:18 51:12,13 52:12,15 54:6,11,15 54:25 55:1,4,5,8,9 56:9,21 57:5,17,19 59:6,10,11,14 60:1 60:2 61:2,4,24 62:10,18 63:7,21 65:14,16 67:8,12	clean 8:22 9:6 67:22
boxes 18:17,21,25 19:4,15 26:6	carry 41:7 52:18,24		clear 13:8 17:19 29:19 34:6 48:5 57:21 60:11,18,19 66:17 68:17 69:8
Brauser 3:3 70:3,20	carrying 40:18 54:3		clearly 14:7,21 57:8
break 7:7,11 27:20,24 51:5 66:1,8,11	case 1:10,11,12 5:9 9:12 10:22 11:11,14 12:6 31:8 33:1 37:16 53:25		click 9:3
breaks 7:6	cases 10:12 11:17		close 61:25 62:1
broad 52:21	centered 48:12		Cn 39:4,7,9,12 40:1,5,12 40:22,23 41:20 42:2 42:21,25 43:4,8 44:1,25 45:3 47:6,8 51:12 52:2,7,12 54:11,15 55:1,5,6,9 55:11,13,23 56:12 56:16,16 59:8,12,17 59:19,21 60:2,8,9 60:12,12,22 62:10 62:19,21 63:19,22 64:9,25 65:3 68:25
broadcast 19:20	certain 30:16		Cn's 59:10
brought 40:17	certainly 15:13 16:11 23:4 57:13 68:5		Cn1 55:23
bus 52:2,6,24 53:8,17 54:16 55:17,25 56:25 58:5	CERTIFICATE 70:1	characterize 46:3	collaboration 14:7
B2 1:10	certified 1:25 3:3 5:3	chatbox 9:3 30:3,14	collectively 13:22 14:12
C	certify 70:5	check 30:15	column 28:3,6 49:1
C 5:1 58:8,12,22 65:22 65:24 69:1,7	chain 46:4,15,19 47:1,5,8 47:12,14	chip 11:8,14	combination 10:3 18:16
cable 1:3 2:2 5:10 18:22 19:10,11 20:5	chains 46:1	circuit 20:22 21:2 37:8 51:19 52:3	Comcast 1:3 2:2 5:9
calendar 9:22	change 59:2,4	circuits 30:25 31:2 44:20 46:1	come 44:25 59:11 62:21 66:2
California 2:12	changes 59:5	Cisco 18:13,16	comes
call 14:8	channel 25:24,24 26:4 43:4 43:15,16,19 44:15 44:17,19,21 45:1,3 45:17 47:3,6,19 48:3,9,11,12,16,18 48:19 52:1,2,7 55:22 57:1 58:24,24 59:2,5,6,7 60:13	cited 16:11	
called 3:2 31:1		claim 37:1,2 48:22 49:3,10 49:24 50:3,7,11,13 50:24,25 51:2 61:3	
candidate 55:23 56:7		claims 22:13,23 23:2,3,4,10	
capable 18:22 19:1,5			

37:21 38:16 62:11			
coming	convenient	cover	59:8,9,12,17,19,20
59:14 65:4	30:9	20:24 31:10	60:2,7,8,11,12,21
commencing	converter	covered	62:10,18,21 63:18
3:6	37:7,18 38:15,22	6:7	63:21 64:9,25 65:3
Commission	43:2	covers	65:7,7,9,10,17,19
70:24	copies	51:22	65:19 67:13,15,18
commonly	8:18,22 9:7,8 12:22	create	67:23 68:2,4,7,10
28:15 31:25	copy	47:2	68:10,10,21,24,25
Commonwealth	9:2	created	69:5
3:5 70:21	correct	60:12	C2
Communications	6:10 7:16,20 8:3 9:9	CRR	41:11
1:3,7 2:2,9 5:10	11:24 12:24,25	3:3 70:3,20	
completely	13:24 16:24,25	current	D
66:16	17:17 18:17,18	5:21	D
complex	20:17,18,25 24:6,9	Cuviello	5:1 56:9,21 58:8,12
46:4,8,10 47:25	24:10,13,21 25:10	2:3 4:2 5:6,8 16:1	58:22 65:12,24 69:2
49:13,19,20,21	25:18,19,25 26:12	19:17 20:2,12 22:20	69:7
computer	26:25 27:7 28:19,23	23:11,19 24:1 27:19	data
8:21	30:25 31:20,23 32:2	27:22 29:3,12,20	27:4 28:13,14 29:1
concluded	32:6,10,11,19,20,23	30:5,13,23 33:5,12	29:15 34:12,15 35:7
69:17	33:8,21 35:8,10	33:17 34:3,24 35:3	52:18,24 53:8,23
conclusions	36:10,15 37:9,23	35:18 39:21 40:4,20	54:3 58:19 59:2,5
15:2	38:5,6,9,19 39:5,10	41:9,13 42:1,9 43:7	61:14,20 62:5,6,9
consider	42:12,17,21 43:9	44:4 45:2 46:24	62:11,12,17,25
31:3 50:14	45:6,21 46:12,16,17	48:24 51:4,8 52:23	63:13 64:4,13 65:8
considerable	46:20 47:1,6,9,16	53:4,10 55:7,24	65:10,18,21,23
50:21	47:17,20,25 48:4,9	56:10,18,23 57:9	67:15,15,23,23 68:2
considered	49:4,11,17,21,22,25	58:17 61:13,18	68:4,4,7
27:11	50:1,5 51:14,15,20	62:23 63:11 64:1	databus
considering	52:4,5,9,13 54:7,12	65:6,25 66:6 67:11	52:11,15,17 53:12,13
41:15	54:13 56:2,6,13	69:10,14	53:20,21,22,24 54:3
consisting	57:15 58:5,20 59:3	CV	54:6
37:16 38:21	59:17 60:9 66:25	10:14,19 20:15	databases
consult	67:4,13,14,17,25	C's	52:8 53:18
12:15	68:7,15,23 69:5,6	57:4,25 65:13	date
consulted	corresponds	C1	12:4 17:2,7,9
12:12,14	49:15,20,24 50:4	39:4,6,9,12,25 40:5	DAVENPORT
contain	counsel	40:12,21,23 41:10	2:4
65:10,17,20	9:13,14,16 12:12,14	41:20 42:2,20,25	day
context	12:15 14:2,9,11,16	43:4,8,25 44:1,5,24	3:6 70:17
52:22 53:3,5	70:10,13	45:3 47:3,8 51:12	days
Continuing	Counselor	52:2,7,12 54:11,15	12:16
25:4	36:22 41:16 42:13	55:1,5,6,9,11,13,17	DC
controlled	46:7	55:22,25 56:6,12,16	2:6 48:13
44:14 47:15	court	56:16,20,25 57:14	decimated
	1:25 3:4 6:6	57:17 58:4,4,6,19	27:2 34:22

decimator 26:19	deposition 1:15 3:1 6:10 7:7,14 12:9 14:25 15:4 16:17 30:19 69:17 70:4,6,11	30:24 31:1 37:18 38:8,15,22 39:3 43:2,19 44:21 45:1 45:14,16 47:19,24 49:3,6,10 50:3,4 53:16 54:23 55:1,5 55:22 59:25 60:2,13 62:7,22 63:1,14 65:4 68:11,12	60:1,7,11,21 61:2,6 61:14,20,24 62:9,13 62:18,20,25 63:8,14 64:4,13,20 65:2
decision 16:10	depositions 7:1 15:13	digitized 24:8 25:1 26:2,4,15 26:23 35:6 37:22 38:16 39:5 43:1,6 61:8 62:2 63:9,23 66:24 67:1	Dm's 59:13,22
declaration 13:5,6,10,11,14,24 14:1,5 15:10 16:8,9 16:11 17:13,14 20:14,14 21:4,4 22:9 24:16 25:8 36:5 37:10 51:22 54:20,21 60:6 61:10 63:6,25	describe 20:22 32:15 55:15	digitizer 56:17	document 24:14 35:9 36:16 49:8 51:24 56:4
declarations 7:14 8:19,22 12:10 12:22,23 13:17,18 14:11,15,19 15:1,3 15:6 16:5 18:8	DESCRIPTION 4:5	digitizes 37:15 38:7,14,20	documents 12:13 15:12
declared 10:21 11:2,9,10,17	designed 20:22	directed 49:3	down-converted 61:8 62:2 63:9 67:1
declining 11:15	desired 24:13,18,20,24 25:5 25:20,23 26:1,4,9 28:11 35:5 36:14,17 36:25 37:3,8,17 38:18,21 44:16 45:20,24 48:10 61:3 67:4,8	direction 70:9	down-converter 36:10,12,19 38:3,14
definite 64:24	desktop 8:21	disclose 61:5	down-converts 38:13
definitely 13:25 57:7 59:5 65:11	detail 50:13,21 61:11	discloses 57:8	dozen 12:6,6 13:16,16,21 13:21
demodulator 28:13 34:12	detailed 50:11 51:1	disclosure 50:8 51:2	Dr 5:7 9:11 27:23 30:4,7 51:9 66:7
demodulators 25:6 55:2 60:4	details 9:22	disconnect 46:22	drafted 14:9,10,11,16
demultiplexed 54:1	devices 60:15	discuss 14:1	drawing 33:11
demultiplexer 32:13,17 39:1,3 43:19 44:6 45:17 51:13 54:2 57:2 61:22 62:8 63:15 64:5,14 68:15	diagram 45:13	discussion 51:10	drawings 8:11
demux 39:19 44:21 45:1 60:13 62:22 63:1 65:5	difference 19:18 56:24 57:7,11 58:19 64:25	Discussion 69:15	drawn 32:25
depends 20:10 43:22,23 52:22 53:2,7,8,8	differences 19:23,24 20:1	distinct 65:11	drop 9:2 30:3,14
	different 17:20 18:2,7 19:25 21:16 25:23 57:13 58:11,11,14 60:14 60:15,16 64:8 65:24 67:4	division 52:16,19,25 53:19,24 54:2,3,5 57:1	duly 5:3 70:5
	digital 20:23 24:5 28:13	Dm 52:16 54:7,10,14,25 55:4,6,8,21 56:1,11 56:15 59:16,19,20	D's 57:6,19,19,25 58:7 65:21
			D1 52:15 54:7,10,14,25 55:4,6,8,13,21 56:1 56:11,15 57:15 58:20 59:15,19,20 59:22 60:1,7,11,20 61:2,6,14,20,24 62:5,6,9,12,18,20

62:25 63:7,13 64:4 64:13,20 65:2,7,8 65:10,17,19,19,20 68:22,24 69:5	52:2 enters 35:1 56:25 entire 43:3 57:12 entirety 13:23 15:11 35:24 Entropic 1:7 2:9 9:24 10:2,4 equal 27:9,15 error 21:12 Esquire 2:3,4,4,10 estimate 12:19 eventually 26:17 EXAMINATION 5:5 EXAMINATIONS 4:1 examined 5:4 example 11:16 14:8,10 16:7 22:13,22 44:22 45:8 47:14 51:19 52:15 55:18 60:24 63:21 exhibit 4:6,7 8:17 13:2 29:22 29:23 30:1,3,20,22 31:3 35:14,17 exhibits 4:4 15:20 16:10 30:8 exit 32:9 experience 18:12 expert 10:13,21 expertise 11:7 Expires 70:24	explain 38:10 45:23 61:11,23 63:24 explained 63:20 64:10 explains 59:23 express 64:23 extent 18:4 21:15 51:1 61:1 extracted 67:9,13 extracting 26:3 extracts 39:6 47:8	60:10,15 66:14,17 66:18,21 figures 23:6,18 file 15:4,15 filed 14:14,22 filing 17:7 filter 26:18 36:12 46:12 48:14,17 49:13,23 49:24 filtered 27:2 34:22 finally 48:14 financially 70:14 find 33:2 fine 30:13 finish 7:10 firm's 9:17 first 5:3 9:11 28:7 46:19 47:1 49:14 five 12:19 66:3,3 fmeeker@banner... 2:7 folder 30:8,18 follows 5:4 foregoing 70:4,6 forgot 66:10 form 7:3 15:24 19:13,21 20:6 21:22 22:15,25	
D1's 59:13				
E				
E 5:1,1 earliest 17:2 edit 14:12,16 EDT 1:18 effective 17:7 electromagnetics 20:20 electronic 21:22 element 49:14 elements 49:11 embodiment 23:7 embodiments 23:24 43:13,16,25 44:17 45:15 48:11 employed 70:10,13 employee 70:13 enabled 23:5 engaged 10:5 11:6 engagement 9:23 10:7 engagements 10:9,11 enter 32:5 entering				
		F		
		fabrication 11:8,14 fact 13:19 69:9 fails 61:4 fair 15:16 46:3 fairly 30:6 familiar 16:19 19:8 31:6,7,9 far 11:13 figure 21:24 22:2,12,22 23:6,9,13,20 24:3 25:7 26:5 27:1,5 28:16,19 31:17 32:8 32:25 33:6 34:7,8,9 36:2,6 37:8 39:11 40:6,9,19 41:6,8 44:2,9,22 45:5,7,8,9 45:12,17 46:13 49:16,21,25 50:5,8 51:2,10,16,19,20 52:1,9 54:9,24		

23:14,21 29:9 32:24 33:9,22 34:20 35:2 37:24 39:14,24 40:15 41:1,12,23 42:5,22 43:20 44:7 50:21 52:20 53:1,6 54:17 55:19 56:3,14 56:22 57:3 58:13 60:23 61:17 63:2,6 63:16 64:15 67:5 formed 27:13,16 forming 31:4 frame 18:19 FREDERIC 2:4 frequencies 24:12 33:21 34:18 38:17 39:5 41:21 42:3,7,8,12,17,20 43:1 45:4,21 61:7 61:16,21 62:1,7,14 63:1,9,20 64:7,10 64:11 65:1,4 67:2,3 67:10,16,20,21,24 68:14,20 frequency 19:19,24,25 20:3,5 25:20 36:14,20,21 37:22 38:4,5,8,13 40:11,14,25 43:18 44:5,15,25 47:16,18 47:23 67:18 68:16 frequency-shifted 68:18 69:4 frequency-shifting 44:23 front 24:6 function 44:23 functional 57:12 functions	41:7 further 25:4 69:11 70:12 G G 5:1 Gaston 5:18 Gates 10:1,3 general 51:3 generally 19:14 22:8 31:12 43:5 63:22 generate 38:8 give 41:14 go 40:6 51:9 63:24 goes 11:13 61:10 going 6:20 13:5 26:18 29:24 30:17 54:8 59:10 Good 5:7 Great 5:20 7:25 9:10 17:11 21:23 28:1 66:13 guess 27:10 68:1 guys 27:20 G-A-S-T-O-N 5:19 H hand 12:7 64:25 65:9 Hardie 1:15 3:1 5:2,14 head	6:13 hear 33:16 heard 6:21 31:11 held 69:15 helps 22:10 HENDIFAR 2:10 15:24 19:13,21 20:6 22:15,25 23:14 23:21 28:24 29:8,16 30:2,7,11 32:24 33:9,15,22 34:20 35:2,16 37:24 39:14 39:24 40:15 41:1,12 41:23 42:5,22 43:20 44:7 46:21 48:23 51:6 52:20 53:1,6 54:17 55:19 56:3,14 56:22 57:3 58:13 60:23 61:17 62:15 63:2,16 64:15 66:2 67:5 69:12 hendifar@lowenst... 2:13 highlighting 9:7 high-level 33:11 45:13 high-speed 20:23 history 15:4,15 16:9 Hold 68:10 hour 12:2 66:3 hourly 12:1,2 hours 12:6,19 13:14,16,21 H-A-R-D-I-E 5:15	I identical 46:1 identification 30:1 35:17 identified 14:24 16:4 25:18 46:15,18,25 47:4 illustrated 52:2 illustration 31:20 illustrative 22:13 implement 45:16 implementation 43:3 implementing 32:1 important 62:20 69:6 include 24:13,17 25:14 38:17 41:20 42:2,6 50:23 50:25 65:8 included 25:10 27:7 includes 24:12 36:13,14,17 37:1,3,8 42:11,16 45:20,23 46:4 49:11 53:16 67:3 68:4,7 including 23:5,18 36:20 38:18 independent 23:8 index 4:1,4 46:15,19 47:1,5 47:14 indicate 20:16 27:6 indicated 41:7 50:22 input
---	--	--	--

24:9 25:1 26:2,4,15 26:23 34:19,19 35:1 37:7,15 38:4,12,20 38:25 41:21 42:3,10 42:15 43:3,6,19 44:6 45:4,19,25 47:20 50:5 51:14 57:5 59:18 60:13 61:21 62:7,14,21 63:14,23 64:5,14 67:17,24 68:14 inputs 60:14,16 64:20 inside 25:13 45:1 institution 16:10 Integrated 30:25 31:1 integrity 20:17 21:12,15 interested 70:15 interface 26:25 27:4 28:15,18 28:21 29:1,14 31:20 31:23 32:4 33:6 34:12,15 35:8 52:18 interfaces 32:2 internal 44:20,21 interpreted 64:20 interrupt 30:12 invention 16:23 17:2,6 23:7 43:14 44:18 45:15 involved 9:12 10:15,25 11:12 11:15 14:8 involves 7:19 8:5 IPR 1:12 7:15,15 8:17	10:2,15,17 13:5 IPRs 10:4,8 14:6 IPR2024-00432 1:11 IPR2024-00435 1:10 issue 50:19 issued 17:9 58:21 i.e 48:12 J January 70:24 jdavenport@bann... 2:8 JOSHUA 2:4 K K 52:8 keep 13:4 kind 11:11 know 6:7 7:1,7 10:5 11:4,5 11:7,8,8 12:13 13:17 14:7,10,21 15:3,6,14 16:7 23:6 23:8 26:18 27:12 30:18,21 39:16,22 40:18 41:6 43:23,25 44:2,24 50:6,10 52:14,17 53:12 54:1 57:20,24 58:21,23 61:10 63:5 64:8,18 68:2 known 28:15 32:1 K&L 10:1,3	L L 2:4 label 26:6 58:11 labeled 13:1 58:12 language 37:1,2 58:25 large 30:6 layout 21:2 leaves 57:1 left 31:19 32:5,21 36:9 45:19 52:3 66:21 legal 14:8,9 23:16 Lett 15:5 17:22 Lett's 15:5 17:16,23 let's 9:13 12:21 14:6 16:7 16:13 20:13 24:22 43:10 45:10 51:21 53:14,14 54:18,21 66:2 68:21 level 17:17,20,21 18:3,7 limitations 61:9 62:2 63:10 limited 23:20,24 line 21:10 lines 28:5,6 51:2 listed 10:14 15:9 litigation 11:21 little	18:11 46:16 LLC 1:3,7 2:2,9 LLP 2:11 location 5:22 long 9:25 12:17 longer 45:3 58:8 look 30:10 looked 50:13 Looking 50:14 looks 54:2,19 lot 19:24 53:9 Lowenstein 2:11 9:18 10:4,7 lower 36:21 37:16 38:4 low-pass 46:11 48:14 49:13,23 49:24 M M 2:4 57:23 58:16 59:11 manner 52:16,19,25 53:24 mapped 56:8,20 57:1,18,25 58:2,7,20 65:11,20 mapping 57:24 58:22 64:21 March 1:17 3:6 70:17 marked 30:1 35:17 MARKED/IDENT... 4:5
---	--	---	---

markings 9:7 matches 47:18 materials 14:25 15:6,20 16:3 matters 10:2,5 mcuviello@banner... 2:7 mean 9:25 11:1 12:5 15:21 16:6,7 19:22 25:12 26:17 29:6,11 30:12 31:7 32:14 33:3,10 35:10 40:10,13,24 41:3 43:21,23 44:8 50:6,16,17 52:22 55:10 56:5 57:17 59:4 60:10,10,13,15 61:11,23 68:2,17 means 29:2,4,5 40:16 41:4 45:24 meant 21:12 MEEKER 2:4 meet 12:17 meetings 12:18 merely 6:13 methods 28:16 MICHAEL 2:3 middle 7:9 Mike 5:8 minutes 66:3,3 mixer 25:15,23 26:3	mixers 24:23 25:17 26:1,6,9 Mobile 5:19 modulator 27:4 moment 16:7 50:19 Monica 2:12 months 14:21 morning 5:7 move 16:2,13 18:10 20:13 multichannel 44:12 47:19,24 50:3 multichannel's 50:4 multiple 45:21 52:12 53:18 multiplex 52:16 53:24 multiplexed 54:4 multiplexer 32:8,17,21 33:7 41:22 42:4,11,16 46:5 48:2 53:19 54:5 62:14 multiplied 44:13 47:23 multiplier 46:8,9,10 47:25 48:5 48:8 49:13,19,20,21 N N 5:1 25:20 27:5,6,9,11 27:15,17 28:11 37:16 38:21 46:16 47:5 57:23 58:16 59:11 name 5:11,12,14 9:17	31:11 native 31:14 natively 13:19 nearly 30:16 necessarily 29:10 need 7:7 9:4 57:12 neither 70:9 never 21:13 nods 6:13 noncontiguous 43:5 63:23 normally 32:7 Northwest 2:5 Notary 3:4 70:1,20,23 note 17:24 69:7 November 27:6 number 4:5 25:9 27:6 30:1 35:17 46:16 Numbered 25:11 numerically 44:14 numeric-controlled 46:5,11 47:15 49:12 49:15,16 O O 5:1 oath 6:10 objection	15:23,24 19:13,21 20:6 22:15,25 23:14 23:21 28:24 29:8,16 32:24 33:9,22 34:20 35:2 37:24 39:14,24 40:15 41:1,12,23 42:5,22 43:20 44:7 52:20 53:1,6 54:17 55:19 56:3,14,22 57:3 58:13 60:23 61:17 62:15 63:2,16 64:15 67:5 objects 7:3 obtained 42:8 obvious 61:5 obviously 20:9 occurred 11:21 occurs 44:3 57:25 office 1:1 10:16 officer 70:3 Oh 10:14 21:11 30:10,16 37:11 okay 5:18,24 6:2,6,18,19 6:25 7:8,13 8:4,8,13 8:20,24 9:5,10,11 9:19,23 10:6 11:13 11:18,23 12:8,20,21 13:4,23 14:23 16:13 16:16 17:11 18:14 20:3,13,24 21:3,5,7 21:17,18,20,23 22:1 22:6,11,11,12 24:2 24:4,8,11,19 25:3,9 25:22 26:20 27:18 27:20 28:4,6 29:13 29:18,21,24,25 30:2
---	--	--	--

31:13,15 32:16 34:6 34:10,13,16 35:15 36:2,3,19 37:21 39:9 40:8 41:17 43:18 45:7,25 46:4 46:9 47:4,11,13 48:14 49:2,9,10 50:22 51:6,9,11,16 51:18,25 52:1 58:2 59:7,15 62:24 63:3 63:12 64:2 66:4,13 66:19,20,23 67:12 67:22 68:10,13,21 69:3,10 once 37:12 56:7,20 57:18 open 9:3 61:25,25 opening 30:20 operates 36:7 opined 50:7 opinion 17:20 18:6 23:12 24:19 27:14,16 50:12,18,19,21 58:10,22 60:20 63:7 63:13,17 64:4,13,23 opinions 18:1 31:4 63:6 opposed 58:12 order 15:1 ordinary 16:14,22 17:20 18:3 18:7 originally 33:20 originate 34:25 56:12,16,17 59:16 62:6,13,18 63:14 originates	63:18 oscillator 44:14 46:5,11 47:15 49:12,15,17 outcome 70:15 output 24:11 25:6 26:15,18 26:24 27:1,3 28:18 28:22 29:7,15,15 34:11,15 35:6,7,11 39:10,19 40:1,2,3 42:20 44:13 47:16 51:13 55:3 56:1 57:15 58:6 59:19 60:4 66:21 67:13 68:22 69:5 outputs 24:17,20 25:17,23 35:11 41:20 42:2 48:2,6,8 54:6 60:14 60:16 66:24 outputted 28:23 outside 11:6 overlap 13:18 owner 1:8 2:9 9:14,15 P P 5:1 page 4:2 16:8 31:13,14,14 31:16 48:25 pages 30:21,22 paid 11:23 12:3 paper 8:16,18 papers 14:13 paragraph	17:5,12,25 21:3,6,7 22:9 24:16 25:8 26:5 36:4 37:10,11 37:20 38:10,24 39:8 42:24 43:12 45:10 47:21 48:20 51:22 53:15 54:19,20 57:20 60:5,6,25 61:23 63:21,25 64:10 parallel 10:1 26:24 27:4 28:12,14,18,21,25 29:1 31:20 32:2 34:11 PARHAM 2:10 Parm 15:22 part 67:20 68:19 particular 32:23 parties 70:11,14 passed 52:12 passes 48:15,19 52:7 patent 1:1,1,8,10,11,12 2:9 7:19,22,23 8:1,1,3,5 8:5,7,14 9:14,15 10:16 17:9 21:25 22:23,23,24 28:3 34:2,5 37:14 64:22 patents 8:10,15,23 11:20,21 12:11 13:20 16:23 17:3 21:19 22:14 path 25:14 28:23 29:7,15 32:16,17,23 33:8,14 33:19 35:11 39:10 paths 25:10,13 26:3 27:7	39:20 PDF 31:14 people 11:5 perform 44:23 performed 23:8 50:10 51:1 57:6 64:18 permission 8:22 person 16:22 personal 5:22,23 16:14 petition 15:6,14 16:9 63:5 petitioner 1:5 2:2 3:2 5:9 10:16 61:1 petitioners 10:18 Petitioner's 63:5 phrased 64:17 Ph.D 1:15 3:2 5:2 picks 39:3 Pico 2:11 picture 31:22 please 5:17 21:25 33:4 37:5 41:25 42:13 46:23 plurality 24:12 28:22 29:14 33:20 34:18 36:14 38:17 39:4,18 41:21 42:3,11,16,20 43:1 61:3,7,15,21 62:1,7 62:13,25 63:8,20 64:7,9,11 65:1,4
--	--	--	--

67:2,10,16,19,21,24 68:14,19	probably 12:18	43:22 46:23 57:10 58:3 62:4 64:3,12 64:12,17,18 68:6	19:11
point 58:1,7 66:1	problem 9:1	questions 6:8 69:11	received 36:9
portions 14:15 15:15,16	proceedings 7:15,19 10:15 12:23	quick 30:15	receiver 22:5
ports 55:3 60:4	processed 36:9,11 39:18 44:9	quote 39:7 54:19 59:23 61:25,25 62:1,1	receives 19:11 24:8 38:3,12
POSA 16:18	processing 20:25 21:9,14,16 44:3	quoted 60:5	receiving 18:22 19:1,5
POSITA 16:18	produce 47:6	quoting 22:18	Recess 27:21 51:7 66:5
position 25:22 62:24	proposed 17:17,24		recognize 22:2
positive 64:21	prosecution 16:9	R	recollection 15:21 23:23
possibility 68:23,25	provide 6:12 17:20	R 5:1	record 5:13 48:21 69:15
possible 57:17 64:19	provided 18:6	Rabaey 31:11	redirect 69:12
precise 64:2	providing 6:3,8	range 27:17	reduced 28:10 70:8
preferred 23:7,24	provisional 17:8	rate 12:1,2 28:10	refer 7:21 8:2,6 9:1,4 13:6 16:17,21 17:13 21:3 21:18,24 24:2 28:2 31:13 35:20 36:2 51:16
prepare 12:8 15:1,3	Public 3:4 70:1,20	reached 9:20	reference 8:23 12:11 21:8,9 22:8 35:20 36:24 50:20 57:22
prepared 50:19	purpose 69:9	read 12:10,10,11,12,13 28:7 44:10 49:7	referenced 24:5
preparing 14:18	purpose-built 19:16	reading 17:25 24:22 25:4,19 26:8 28:9 37:13 38:11,23 43:11,12 44:11 45:11 53:15 54:22 59:24 60:25	references 9:2,4 14:23 15:17,18 15:19
present 43:14 44:18 45:15 64:5,14	put 41:5 67:7	real 30:15	referring 8:13 17:12 22:9 24:15 32:4 35:21 36:4 37:9 49:16
prevent 6:3	puts 45:22	reason 60:17	refers 28:17
previous 36:23 56:19 64:3,12 66:10	p.m 66:5,5 69:17	reasons 64:10	regard 29:13
Previously 50:22	Q	recall 9:19 11:14,17 12:3 13:13 14:17 16:6 20:8,11	regarding 7:14 20:3
primarily 8:13	qualifications 17:24	receive	
prior 9:23 70:6	question 6:15,16,21,24 7:3,4,9 7:10 33:4,16 35:4 37:6 39:25 40:21 41:15,25 42:14		
priority 17:2			

Registration 70:23 related 30:19 70:10 relative 70:12 reliance 61:4 relies 61:2 remainder 41:6 remember 9:22 11:4 14:20 20:7 REMOTE 3:1 render 61:5 repeat 6:24 33:4,16 37:5 40:21 41:25 42:13 46:23 rephrase 35:4 38:2 40:11,22 48:7 50:10 54:13 58:3 61:19 62:5 report 17:5 38:24 42:24 45:24 59:24 60:18 60:25 61:24 64:24 reporter 1:25 3:4 6:6 represent 5:9 65:13,21,22 representation 68:11,12 representing 9:14 represents 65:12 required 61:9 62:3 63:10 residence 5:22,23 respond 63:4	respondents 10:18 responding 64:21 response 63:6 responsible 26:3 rest 40:19 retained 9:13 10:1,3 review 15:1,17 35:24 reviewed 11:19 13:23 14:24 15:4,4,5,11,15,18 16:4,11 50:23 reviews 24:14 35:9 36:16 49:8 51:24 56:4 RF 24:9 25:1 26:15,23 35:6 36:8,11 37:1,7 38:3,12 39:5 43:14 43:16 44:12,15,18 47:19,24 48:11,17 48:18,19 50:3,4 54:24 55:1,4,5,22 60:1,2 66:24 right 7:12 8:9 10:10 17:23 31:2,22 32:10,12 33:7 35:13,24 39:6 48:17 59:18,22 66:17 67:1 right-hand 49:1 RMR 3:3 70:3,20 Road 5:19 room 5:25 rough 12:19	RPR 3:3 70:3,20 Russ 1:15 3:1 5:2,7,15 9:11 27:23 30:4,7 51:9 66:7 R-U-S-S 5:15 S S 2:3 5:1 sampled 38:5 sampling 28:10 Samuel 1:15 3:1 5:2,14 Santa 2:12 satellite 19:1,5,12 20:4,9,10 saying 27:12,13 40:2 56:24 65:2 68:3 says 28:25 29:1 34:21 36:24 43:10 45:10 48:10 51:21 53:14 53:20,22 55:16 scenario 65:9 schedule 11:9 schematic 45:13 Scientific 18:12,15,16 scope 22:16 23:1,9,10 27:11 28:24 29:8,16 33:23 39:15 50:7,7 50:11 55:20 67:6 screen 29:24 scroll	48:22 second 8:1 21:10 49:7 section 14:8 see 9:13 14:6 16:7 21:6 24:4,22 31:17,18 39:11 43:10 45:10 51:21,25 53:14,15 54:18,21 select 26:1,9 47:16,23 55:17 selected 25:5 26:14,22 33:20 34:18 35:5 54:12,12 54:16 55:4,6,10,16 55:22,25 56:8,20 57:6,14,18,19 58:1 58:4,5,6,9,15,16,19 58:24 59:6,7,11,12 59:13,22 60:11 61:6 61:16,24 62:10 63:8 64:8 65:3,7,12,13 65:14,17,20,21 68:13,22,24 69:2,7 selecting 24:25 25:24 26:10 selection 55:23 56:7 57:5 59:1 59:1,4 selector 51:14,20 52:3,7 53:16,17 54:16,23 55:17,25 56:25 57:24 58:5,16 59:11 59:18,25 selects 24:20,24 25:23 32:22 33:7 54:24 59:25 send 60:3 sends 55:2 sense
---	--	---	---

13:12	26:15,23 28:23 29:7	57:10 58:15 61:22	28:13
sent	32:22 33:7 35:1,6	65:11,19 66:18	Street
28:12	35:11 36:8,11,13	sort	2:5
sentence	37:1,15,23 38:7,13	13:19	structures
28:7,17	38:16,21,25 39:5,19	sound	32:1
separate	40:23 42:4 43:6	16:18	struggling
39:19	44:12,16 45:19,25	sounds	68:1
serial	47:19,24 50:3,4	22:18 23:15,16	study
26:24 27:4 28:12,14	63:24 64:5,14 66:24	source	50:16,20
28:17 29:13 31:23	68:19 69:5	56:12 59:16 60:8,21	subsequent
32:1,4,17,23 33:6,8	signals	64:8	40:18
33:14,19 34:11	18:23 19:2 25:2 32:5	speak	subsequently
52:17,18,24 53:7,12	32:9,18 43:9 65:22	27:23	54:1
53:21	65:22	speaking	subset
serially	Signature	19:14	42:8 43:5 54:11,15
52:13	69:16	specifically	55:9,13,15 59:8
series	significance	18:12	63:23 64:9
60:17	65:24	specification	Suite
served	significant	8:14 13:20 23:18	2:5
10:12	58:23	29:18 51:3	supported
set	signing	specifications	23:13,16,17
10:9,10 18:17,21,25	13:24	8:11 23:3,4,5	sure
19:4,8,10,15	Similar	specifics	5:14 13:7 17:15 30:5
share	37:14	11:5,17 12:7	30:12 43:21 52:14
8:10 29:24	simplified	split	55:14 66:15
shifted	45:12	13:16	switch
25:20 43:15 44:16,19	single	starting	12:21 35:13
45:1 48:3,9,10,12	29:15 52:11	66:20,21	switched
67:18	sitting	state	34:4
shifts	53:11 63:12	5:12 21:8 22:4 26:8	sworn
36:19 38:4	six	stated	5:3 70:5
short	12:19	5:11 17:21 45:8	synchronize
9:25 68:17	skill	56:19	14:13
show	16:14,22 17:17,21	statement	system
52:10	18:3,7	26:12	20:9,10 22:5 36:9
shown	slightly	STATES	systems
28:16 44:9,22 46:13	18:2,7	1:1	20:4,5,23
60:15	small	stenographer	
shows	46:22	5:4	T
31:19,22 44:3	sorry	Stenographic	take
side	15:22 22:17 25:7	1:25 3:4	7:6,11 27:19 49:6
52:3	29:17 30:11 33:3,15	straight	50:16 51:4 65:25
signal	33:18,24 34:4 35:19	13:4	taken
20:17,25 21:9,12,14	36:22 37:5 41:24	straightforward	1:16 27:21 51:7 66:5
21:15,16 24:9,11	42:13 46:7,7,21	43:24	70:4,7,12
25:10,12,14 26:2,4	48:5 49:19 54:13	stream	talk

16:8 66:7,11 talked 51:12 talking 7:23 33:25,25 34:1,7 34:7 35:14 65:15,16 65:16 target 43:14 44:15,18 47:18 48:3,8,11,16,18,19 techniques 21:2 technology 10:24 11:13,15 television 18:22 19:2,6 61:3 tell 5:21 6:19 10:24 term 23:16 terms 11:1 16:18 52:22 testified 5:4 testimony 6:4 15:5 66:16 70:7 textbook 21:9 31:6 34:1 thank 15:25 17:11 21:17 69:13,14 thereto 70:14 thing 62:20 things 13:4 15:14 20:21 53:9 think 11:11 12:18 13:19 15:9 21:11 23:4,17 31:11 35:10 56:6 60:18 69:10,13 thinking 36:23 third	8:5 21:10,10 thought 11:10 37:11 three 7:15 8:15,18,23 11:20 12:18,23 13:17,18,20,22 21:21 22:13 49:11 time 16:22 17:2,6 18:12 18:19 32:23 50:16 52:16,19,25 53:18 53:24 54:1,3,5 57:1 66:15 times 11:9,10 titled 30:24 today 6:4,10 7:14 11:24 23:12 53:11 58:10 60:20 62:24 63:12 today's 6:10 12:9 16:17 Tom 5:18 top 18:17,21,25 19:4,10 19:15 31:16 tops 19:8 total 12:4 20:8 tracking 47:21 TRADEMARK 1:1 transfer 30:17 transmission 19:25 20:4 transmit 32:22 33:8 transmitted 32:18 33:13,19 53:23 54:6	trapezoid 32:5,7,10,12 traveling 57:21,23 TRIAL 1:1 truthful 6:3 trying 33:1 68:6 Tuesday 1:17 3:5 tuner 45:14 49:4,6,10 two 19:18 typewriting 70:9 typographical 21:11	1:6 valid 18:1 variable 27:5 verbal 6:12 41:14 version 37:22 38:8 67:18 68:18 69:2,2,4,7,8 versions 59:13 versus 23:9 50:7 Virginia 3:5 70:21 VIRTUAL 2:1 Virtually 1:16
		U	W
		understand 6:9,20,24 7:2,13,18 7:22 8:9 16:21 17:1 17:6 29:4,5 35:21 64:17 66:15 68:3,5 68:6 understanding 16:14 22:22 36:6 47:7 52:6 undesired 24:13,18,25 25:24 26:11 36:15,18,25 37:3,9,17 38:18,22 45:20,24 67:4,9 UNITED 1:1 unselected 58:23 59:14 65:22 69:1,8 uses 27:5	Wait 33:24 36:22 waived 69:16 walk 36:5 47:11 66:14 want 9:1 18:10 30:12 66:14 wanted 11:11 Washington 2:6 wasn't 57:10 64:11 waveform 68:11,12,13,16 way 17:4 20:21 32:14 42:23 45:22 46:2,3 59:23 64:16 67:7 ways 64:19 Weatherwax
		V	

2:11 9:18 10:4,7	9:22	11:30	35:22
we'll	yellow	51:7	2007
7:6 17:13	37:16,19	11:55	18:19,20
we're	Z	66:5	2009
7:9 34:6,7 45:7	Zhang	1100	13:2 17:8
wideband	8:23 12:11 35:14,21	2:5	202
22:5	35:25 36:6,24 37:8	12:05	2:6
wider	37:15 38:12,20 39:7	66:5	2024
20:4	40:9,9 43:1,4,11,25	12:10	9:22 14:20,22
Witcoff	44:10,22 45:10,22	69:17	2024-00432
2:5 5:8	47:22 48:21,25	1200	7:15
witness	50:23 51:10,17,21	2:5	2024-00438
3:2 15:22 19:14,22	53:14 54:19 55:15	13th	1:12
20:7 22:17 23:2,15	57:7,20,22 58:25	2:5	2025
23:22 24:14 28:25	59:9,23 60:5 64:22	13712	1:17 3:6 70:17
29:10,18 30:10,15	66:17,18 69:8	5:18	2028
32:25 33:10,24	Zhang's	14	70:24
34:21 35:9 36:16	43:3	17:5	206
38:1 39:16,25 40:16	1	140	8:7,10 11:20 12:24
41:3,24 42:6,23	1	30:21,22	13:11 16:23 21:19
43:21 44:8 49:8	24:9 25:11 27:9	16	22:23
51:24 52:21 53:2,7	46:16,19 47:1,14	17:12,12	21
54:18 55:21 56:4,5	52:8,15,17 53:12,24	17th	48:22 49:3,10,24
56:15 57:4 58:14	1B	17:7	50:3,7,11,13,24,25
60:24 62:17 63:3,17	61:9 62:2 63:10	18	51:2
64:16 67:7 70:5,7	1C	1:17 17:13,25	210
worded	61:9 62:3 63:10	18th	36:10,12,19 38:3,14
17:4	10:12	3:6	213
work	1:18 3:6	2	35:14
10:17 11:24 18:11	10:38	2	220
19:4,7,8,9	27:21	21:24 22:12,22 23:6	37:19,22 38:5,7,15
worked	10:45	23:9,13,20 24:3,9	38:22 43:2 66:22
9:24 10:6 12:5 13:14	27:21	27:1,5,15 28:16,19	224-00435
13:15 14:12 18:17	1013	34:8,9 36:2,6 37:8	7:16
18:21,25	4:7 35:16,17,19	39:11 40:19 41:6,8	224-00438
writing	1016	45:9,17 46:13 51:10	7:16
14:4	2:11 4:6 29:22,23	51:20 60:10,15	230
Y	30:1,3,20	66:14,17,18	24:2,8,20 25:9,13
yeah	11,381,866	200	27:7 28:18,22 29:15
10:9 13:1,9 24:17	1:10 8:2	22:7	34:11,19 35:1 39:1
30:16,24 32:14 33:3	11,399,206	2000	39:3 41:22 42:4,11
35:10,12 36:17	1:12 8:6	18:20	42:16 43:19 44:6,21
45:22 55:5 67:19	11:20	20005	45:8,17 51:13 60:13
68:16	51:7	2:6	61:22 62:8,14 63:1
year		2003-0056221	63:15 64:5,14 65:5
			67:17,24 68:15

240 51:14,20 54:12 57:24 58:16 68:22 69:9 25th 70:17 250 25:15,23 252A 25:18 252N 25:18 263 31:14 272A 26:16,23 27:2 34:14 35:8,12 272N 26:16,24 27:2 34:14 35:8,12 28 39:8 57:20 3 3 40:6,9 44:2,9,22 45:5 45:7,8,12 49:16,21 49:25 50:8 51:2 30 4:6 10:14 45:10 300 45:14 307-4514 2:12 31 70:24 310 2:12 44:14 46:6,11 46:14,18,25 47:4,15 49:17 32 22:9 24:16 25:8 26:5 43:12 47:21 48:20 320 46:5,8,10,14,18,25 47:4,25 49:21 33	37:10,20 38:24 50:5 330 46:12,14,18,25 47:4 48:15 49:24 35 4:7 362 7:22,23 8:10,14 11:20 12:23 13:5,6 16:8,23 17:9,14 21:4,19,25 22:23 25:8 28:3 34:2,5 36:5 37:3,14 54:21 60:6 63:25 64:22 36695 5:19 38 53:15 39 54:19 60:5 4 4 32:8 40 10:14 450 12:2 5 5 4:2 16:8 21:3,6 48:25 51:16,19 52:1,9 54:24 5-minute 27:20 500 53:16 57:2 510 52:3,7 53:17 54:12 54:16 55:17 56:1,25 58:5 520 53:18,20 530 53:19 54:2,5	55 28:5,6 58 28:5,6 6 6 28:3,6 6-25 31:17 66 51:22 67 54:20 60:6 7 70 60:25 61:23 73 36:4 74 36:4 37:11 38:10 75 42:24 63:21,25 64:10 7675529 70:23 8 80 31:13,14 824-3307 2:6 866 8:3,10 11:20 12:24 13:10 16:23 21:19 22:24 9 9,210,362 1:11 7:19,23 90405 2:12
--	--	--