

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

Case No. IPR2023-00598

U.S. Patent No. 10,462,767

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SAMSUNG ELECTRONICS CO., LTD. and
SAMSUNG ELECTRONICS AMERICA,
INC.,

Petitioners,

- against -

APEX BEAM TECHNOLOGIES, INC.,

Patent Owner.

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December 22, 2023

10:00 a.m.

DEPOSITION of APOSTOLOS KAKAES, Ph.D., held
remotely via Zoom video conference before Sara
K. Killian, a Registered Professional Reporter,
Realtime Certified Reporter and Notary Public.

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A P P E A R A N C E S :

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STIPULATIONS

IT IS HEREBY STIPULATED AND AGREED by
and among counsel for the respective parties
hereto, that the sealing and certification of
the within deposition shall be and the same are
hereby waived;

IT IS FURTHER STIPULATED AND AGREED all
objections except as to form of the
question, shall be reserved to the time
of the trial;

IT IS FURTHER STIPULATED AND AGREED that
the within deposition may be signed before any
Notary Public with the same force and effect as
if signed and sworn to before the Court.

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2 A P O S T O L O S K A K A E S, Ph.D., after
3 having first been duly sworn, was examined
4 and testified as follows:

5 EXAMINATION BY

6 MR. PYMENTO:

7 Q. Good morning, Dr. Kakaes.
8 Could you state your name for
9 the record?

10 A. Good morning. My full name is
11 Apostolos, middle initial K, Kakaes.

12 Q. Is there any reason that you
13 can't testify truthfully today?

14 A. No, there is not.

15 Q. Have you taken any drugs or
16 alcohol that could impair your ability to
17 testify today?

18 A. No, I have not.

19 Q. Where are you located right now
20 physically?

21 A. In Reston, Virginia at the
22 Finnegan Law Firm office.

23 Q. Is there anyone in the room
24 with you?

25 A. Yes.

1 A. Kakaes, Ph.D.

2 Q. Who is that?

3 A. Mr. Cerulli -- and I may be
4 mispronouncing the name, for which I
5 apologize -- and Mr. Goldberg.

6 Q. If that changes, could you
7 please let me know?

8 A. Yes.

9 Q. What programs do you have
10 currently running on your program aside from
11 the Zoom meeting?

12 A. Adobe Acrobat.

13 Q. Do you have any communications
14 programs open such as Outlook or any email
15 program or chat program?

16 A. No, I do not.

17 Q. Do you have physical paper
18 copies of the record in this case with you?

19 A. I have physical copies of a few
20 documents, but not of the entire record.

21 Q. Are those physical copies
22 annotated?

23 A. I'm sorry? Could you say that
24 again?

25 Q. Are those physical copies

1 A. Kakaes, Ph.D.
2 annotated? Do they have notes on them?

3 A. No, they're not.

4 (Whereupon, Exhibit 1 was
5 marked for identification.)

6 (Whereupon, Exhibit 2 was
7 marked for identification.)

8 (Whereupon, Exhibit 3 was
9 marked for identification.)

10 (Whereupon, Exhibit 4 was
11 marked for identification.)

12 (Whereupon, Exhibit 5 was
13 marked for identification.)

14 MR. PYMENTO: I've marked all
15 the exhibits already. Just for the
16 record, I'll read them off.

17 First document, Exhibit 1, is
18 US Patent No. 10,912,081. That's the
19 subject patent in this proceeding.

20 Exhibit 2 is the Kakaes
21 declaration this was submitted in this
22 IPR.

23 Exhibit 3 is International
24 Patent Publication No. WO 2017/083489
25 to Lee and I'll refer to it as Lee.

1 A. Kakaes, Ph.D.

2 Exhibit 4 is International
3 Patent Publication No. WO 2018/201861
4 to Chen and I'll just call it by Chen.

5 Last, we have the Institution
6 Decision in this IPR, which will be
7 called Exhibit 5 or the Institution
8 Decision.

9 BY MR. PYMENTO:

10 Q. Dr. Kakaes, can you please open
11 your declaration in this proceeding?

12 Let me know when you have it
13 open.

14 A. I do.

15 Q. Do you believe that you
16 considered any other materials aside from
17 the materials cited in this declaration in
18 creating this declaration?

19 A. I considered other material,
20 but I relied on the materials that I relied
21 in my declaration.

22 Q. I've marked as Exhibit 5 the
23 decision granting institution in this case.
24 It was created by the patent office after
25 you submitted your declaration.

1 A. Kakaes, Ph.D.

2 Have you reviewed that decision
3 in preparation for this deposition?

4 A. I gave it a quick read, yes.

5 Q. About how much time did you
6 spend preparing for this deposition?

7 A. Several hours.

8 Q. About how much is several
9 hours?

10 A. I don't remember exactly, but
11 over the course of past few days, I've
12 prepared several hours each day, so, like I
13 said, I don't remember the exact number.

14 Q. Is ten -- somewhere between 10
15 and 20 hours a fair approximate of the
16 amount of time you spent preparing for this
17 deposition?

18 A. I think more than 10 is fair.
19 I'm not sure if it's between 10 and 20.
20 Might be more than 20.

21 Q. When do you first recall being
22 involved in this IPR proceeding?

23 A. Oh, I don't remember. It's
24 been several months. Maybe even a year. I
25 don't remember, but quite some time now.

1 A. Kakaes, Ph.D.

2 Q. About how much time did you
3 spend preparing the declaration in this
4 proceeding?

5 A. I don't remember. It's been a
6 while.

7 Q. Could you provide an
8 approximate number of hours?

9 A. No, because I don't remember.

10 Q. Would more than 50 hours spent
11 preparing this declaration be fair?

12 A. I think more than 50 hours is
13 fair to say.

14 Q. Aside from the attorneys at
15 Finnegan, did you consult with anyone else
16 about your deposition today?

17 A. I mean, I told my wife I'm
18 going to deposition, but not about the
19 subject matter per se.

20 Q. Did you communicate with anyone
21 at Samsung directly about your deposition
22 today?

23 A. No.

24 Q. Have you corresponded with
25 Samsung prior to today regarding this IPR

1 A. Kakaes, Ph.D.

2 proceeding?

3 A. No, I have not.

4 Q. And aside from the attorneys at
5 Finnegan, was anyone else involved in the
6 preparation of your declaration in this
7 action?

8 A. No, there was not.

9 Q. Aside from the '081 patent,
10 which is the patent owned by Apex Beam, can
11 you tell me how the prior art documents were
12 located in this case?

13 A. Some of those documents,
14 they -- one of the attorneys I've been
15 working with provided them to me for
16 analysis and some of the documents I may
17 have come up with on my own.

18 Q. Do you know which ones you came
19 up with on your own?

20 A. No, I would not remember
21 specifically.

22 Q. Can you please take a look at
23 your CV that you attached to your
24 declaration as Appendix A? It's on PDF page
25 132. Just let me know when you're there.

1 A. Kakaes, Ph.D.

2 A. I am.

3 Q. Can you take a look at this CV
4 quickly and let me know if you still think
5 this CV is accurate?

6 A. Yes, I think it's still
7 accurate.

8 Q. Since the time of attaching
9 this CV to your declaration, would you add
10 any employment to the employment history
11 section?

12 A. No, I would not.

13 MR. CERULLI: Julian, sorry.
14 Which page are you referring to? I'm
15 just trying to find it.

16 MR. PYMENTO: You're right. I
17 said PDF 132. I meant 145 of the
18 declaration. I apologize.

19 MR. CERULLI: No worries.

20 Sorry, is there a question
21 pending?

22 MR. PYMENTO: No.

23 BY MR. PYMENTO:

24 Q. Dr. Kakaes, could you please
25 turn to paragraph 75 of your declaration?

1 A. Kakaes, Ph.D.

2 A. Okay.

3 Q. Do you see the sentence which
4 says that: It is my opinion that a person
5 of ordinary skill in the art (POSA) would
6 have had at least a master's degree in
7 electrical engineering or a similar field
8 and at least two years of experience working
9 with telecommunications systems, including
10 multiple input, multiple output MIMO
11 technology.

12 A. Yes, I do see that.

13 Q. Did you draft this section
14 yourself?

15 A. I would have to -- the entire
16 declaration, but the attorneys had some
17 input in editing it and fine tuning the
18 language here and there.

19 Q. That's with respect to the full
20 declaration, correct?

21 A. Yes.

22 Q. Just a few sort of broad
23 questions about signals in general.

24 If two signals have different
25 content, would a person of ordinary skill in

1 A. Kakaes, Ph.D.

2 the art consider the signals to be different
3 or the same?

4 MR. CERULLI: Objection.

5 Form.

6 A. I frankly don't understand the
7 question because it would just depend on
8 what the context is and what those signals
9 are. I don't think I could answer it
10 because I don't understand it.

11 Q. It's relatively simple. If two
12 signals have different content, but perhaps
13 have the same format or are equal in every
14 other respect, would a person of ordinary
15 skill in the art consider those to be the
16 same signal or different signals?

17 MR. CERULLI: Objection.

18 A. I don't understand the
19 question. Signals have content that imply
20 the signals have some content and I don't
21 know what that means in the abstract, so I
22 would need to be more specific in the
23 context in which those signals are being
24 discussed.

25 Q. If two signals are received

1 A. Kakaes, Ph.D.

2 using different beams, would a person of
3 ordinary skill in the art consider the
4 signals to be different signals?

5 A. Again, I would need to have a
6 context of what you mean by those signals.

7 Q. So just for clarification, the
8 signals could be any signals, but all else
9 being equal, the only thing different
10 between the signals is that they're received
11 using different beams.

12 Would a person of ordinary
13 skill in the art consider the signals to be
14 different signals?

15 MR. CERULLI: Objection.

16 Form.

17 A. Again, the question in the
18 abstract, I cannot interpret the question
19 sufficiently well to be able to offer an
20 opinion on that. So if you give me specific
21 context of what those signals are, then
22 perhaps I would be able to answer the
23 question, but in the abstract, I cannot.

24 Q. If two radio signals are
25 received using different beams, would a

1 A. Kakaes, Ph.D.

2 person of ordinary skill in the art consider
3 the signals to be different signals?

4 MR. CERULLI: Objection.

5 Form.

6 A. Radio signals is used in the
7 '081 patent and in that context, we can
8 discuss it. But in the abstract, I don't
9 even know what you mean by radio signals in
10 the abstract. So once again, I cannot
11 answer that.

12 Q. Let's discuss it in the context
13 of the '081 patent, the term radio signals.

14 If two radio signals in the
15 context of the '081 patent have different
16 content, would a person of ordinary skill in
17 the art consider the signals to be different
18 signals?

19 A. Not necessarily. It depends on
20 what that radio signal is.

21 Q. What are some of those
22 dependencies?

23 A. Well, for example, the '081
24 patent describes radio signals and teaches
25 some example of what radio signals are.

1 A. Kakaes, Ph.D.

2 Going to the column two of the
3 '081 patent, for example, at line 19, the
4 patent teaches that the first radio signal,
5 which is obviously a radio signal is a
6 physical downlink shared channel, so the
7 radio signal in this example is the physical
8 downlink shared channel.

9 So a person of ordinary skill
10 in the art would understand that the
11 physical downlink shared channel is an
12 example of a radio signal. In another
13 example at line 20, the patent teaches that
14 the first radio signal is a consecutive data
15 transmission block in tandem. So a person
16 of ordinary skill in the art would
17 understand that that is a signal.

18 In another example, the patent
19 teaches that the first radio signal is G
20 consecutive multi carrier symbols in time
21 domain. So that's another example of what a
22 radio signal would be.

23 There's other examples, but
24 those are some of the examples that the
25 patent teaches would be radio signal.

1 A. Kakaes, Ph.D.

2 Q. So using any of those signals
3 that you just described, if two of those
4 types of signals have different content,
5 would a person of ordinary skill in the art
6 consider the signals to be different
7 signals?

8 MR. CERULLI: Objection.
9 Form.

10 A. If one of those signals is a
11 physical downlink shared channel that takes
12 place now and the other radio signal is a
13 physical downlink shared channel that takes
14 place five hours from now, the person would
15 consider them to be different.

16 Q. Are there any other
17 circumstances in which one would consider a
18 radio signal transmitted on the same channel
19 to be different other than time?

20 A. So you're misinterpreting what
21 I said. It's not the same channel because
22 the first channel that I discussed was
23 happening now and it was the same kind of
24 channel and was a physical down shared
25 channel that happens five hours later. So

1 A. Kakaes, Ph.D.

2 those are two different instances of the
3 same channel.

4 Q. If I have a first radio signal
5 transmitted on the PDSCH channel, it's
6 transmitted on one beam, then I have another
7 radio signal that's transmitted on PDSCH
8 using a different beam, would a person of
9 ordinary skill in the art consider the
10 signals to be different?

11 MR. CERULLI: Objection.
12 Form.

13 A. Well, the way you characterized
14 it is that it's another radio signal, then
15 you're creating a -- it doesn't make any
16 sense. If a radio signal of the physical
17 downlink channel is transmitted, that radio
18 signal is one radio signal and if parts of
19 it are received one way and other parts are
20 received a different way, that is the radio
21 signal that's being received in those two
22 different ways or the same way or whichever
23 way they're received, it constitutes one
24 radio signal for that physical downlink
25 shared channel instance.

1 A. Kakaes, Ph.D.

2 Q. If two radio signals have
3 different modulation or different coding
4 schemes, would a person of ordinary skill in
5 the art consider the signals to be different
6 signals even if they share the same content?

7 MR. CERULLI: Objection.

8 Form.

9 A. A person of ordinary skill in
10 the art would know how to answer that
11 question because it just depends on how the
12 two signals you're referring to have -- how
13 they were created and just knowing that they
14 have a different modulation doesn't provide
15 sufficient information to know that they're
16 the same signal or a different signal.

17 Q. Let's turn to Lee figure 12.
18 On the P tab record, it's Exhibit 1004, if
19 that helps. Just let me know when you reach
20 that figure.

21 A. I did reach that figure.

22 Q. Do you see there are two blocks
23 on the figure titled B1? One is marked by
24 1203 and one is marked 1204?

25 A. Yes, I see 1203 and 1204.

1 A. Kakaes, Ph.D.

2 Q. What are each of those B1s
3 showing?

4 A. So as he explains in paragraph
5 167 -- actually, it's more like 168. So in
6 paragraph 168, he explains the beam ID for
7 TB2 may be signal in a DCI transmitted in
8 control data B1 that is associated with TB2.

9 In addition, the dual TB
10 transmission scheme shown in figure 12 may
11 be used to carry out a full back
12 transmission to be described in more detail
13 below.

14 As a full back mechanism, data
15 carried by TB1 may be a subset of the data
16 carried by TB2 and TB1 may use a lower
17 modulation coding scheme (MCS) value than
18 TB2.

19 So in short, what 1203 and 1204
20 are -- and I should have said that he goes
21 on to explain that in more detail in the
22 following paragraph, 169, but the 1203 and
23 1204 provide the downlink control
24 information, or DCI, for the information
25 needed to decode the data portion of the

1 A. Kakaes, Ph.D.

2 transmission which follows.

3 Q. How does the B1 noted by 1203
4 differ from the B1 noted by 1204?

5 A. I'm not sure I understand the
6 question.

7 Q. Both 1203 and 1204 are noted as
8 being B1 in figure six, correct?

9 A. Yes, there's a B1 in both of
10 them.

11 Q. So how does the B1 noted by
12 1203 differ from the B1 noted by 1204?

13 MR. CERULLI: Objection.
14 Form.

15 A. So 1203 and 1204, as he
16 explains in paragraph 169, transport block
17 1201 may be associated with control TX beam
18 1203 and transfer block 1202 may be
19 associated with control TX beam 1204.

20 So the control TX beam 1203 and
21 1204 provide control information for DCI as
22 he explained earlier in paragraph 168 for
23 the beams used for the respective blocks of
24 transmission.

25 Q. Is the DCI provided in 1203

1 A. Kakaes, Ph.D.

2 provided than the DCI provided by 1204 or
3 the same?

4 MR. CERULLI: Objection.

5 Form.

6 A. I need to understand what you
7 mean by the DCI being the same or different.

8 Q. So in paragraph 169, it says
9 that the first transport block may be mapped
10 on to a first code word provided in the
11 control transmission beam 1203 and the
12 second transport block may be mapped in a
13 second code word transmission provided by
14 1204.

15 Do you see that?

16 A. I see that.

17 Q. So each of 1203 and 1204
18 contains a code word, correct?

19 A. Provide a code word that could
20 respond to the DCI that provides the
21 downlink control information for the
22 respective data.

23 Q. Because each of 1203 and 1204
24 refers to respective data, would a person of
25 ordinary skill in the art understand that

1 A. Kakaes, Ph.D.

2 the code words would probably be different?

3 MR. CERULLI: Objection.

4 Form.

5 A. A person of ordinary skill in
6 the art would understand that the 1203 and
7 1204 form the control information that
8 informs the receiving end, which would be
9 the mobile device of how to receive the
10 following data that falls within that TTI.

11 Q. Does 1203 and 1204 correspond
12 to different aspects of the control
13 information?

14 A. I'm not sure I understand the
15 question.

16 Q. So 1203 provides a first code
17 word, right?

18 A. Yes, it does.

19 Q. And control transmission being
20 1204 provides a second code word, right?

21 A. Yes, I think that's correct as
22 well.

23 Q. Would a person of ordinary
24 skill in the art consider the first code
25 word to be different from the second code

1 A. Kakaes, Ph.D.

2 word?

3 A. The two instances of the B1 is
4 shown in figure 12, provides the control
5 information needed to successfully decode
6 the information that follows in the TTI, so
7 they provide the information regarding the
8 specific beam or beam IDs, time frequency
9 location and the like that enables the
10 successful reception of the data that
11 follows.

12 Q. Because there are two different
13 data blocks, TB1 and TB2, would it be
14 expected that the code words for each would
15 also be different?

16 A. I don't agree with the premise
17 of your question.

18 Q. Which is that TB1 and TB2 are
19 different? Or there are codes words
20 associated with each of them?

21 A. I think you characterized TB1
22 and TB2. I forgot the exact wording that
23 you used, but it didn't sound correct to me.

24 Q. Okay. Let me see if I could
25 rephrase it.

1 A. Kakaes, Ph.D.

2 Would a person of ordinary
3 skill in the art expect the code words
4 associated with each of TB1 and TB2 to be
5 different?

6 A. One would expect them to be the
7 same structure, but would provide different
8 information. TB1 and TB2 are two portions
9 of the data transmission. TB1 is being
10 transmitted using a wide beam, as he
11 explains in the figure 12, and TB2 is
12 transmitted using a narrow beam and the
13 specific aspects needed to receive those
14 respective portions of the data block, for
15 example, beam IDs time and frequency
16 resource locations used for each of them,
17 those specific values will be different in
18 1203 and 1204 because TB1 and TB2 are
19 located at different places on the time
20 frequency resources and they're using
21 different beams and that information would
22 have -- would be conveyed in 1203 and in
23 1204 for the respective portions of the
24 signal representing the data in TB1 and TB2.

25 Q. Okay. Could we please turn to

1 A. Kakaes, Ph.D.

2 figure 13 of Lee? I know it's tilted, so
3 you may need to rotate it.

4 A. I just took it out of the
5 binder so that I could rotate it and
6 actually look at it.

7 Q. Do you see the block on the
8 left side which has first transmission,
9 second transmission and end transmission,
10 there are blocks that are noted coding, RM,
11 modulation and tenor mapping for CW1.

12 A. I do see those.

13 Q. In your understanding, is that
14 a bit block?

15 A. The bit block is the term used
16 in the claim and as I explain in my
17 declaration, the bit block that's relevant
18 to the claim is a transfer block map EDU
19 with the CRC, which is item 1301, which
20 undergoes various steps of processing before
21 it ultimately gets transmitted in the TTI
22 that's at the bottom of the page. So part
23 of that processing involves the various
24 different blocks. The block that you
25 referred to being one of them.

1 A. Kakaes, Ph.D.

2 Q. Overall, what is your opinion
3 of what a person of ordinary skill in the
4 art would understand to be a bit block?

5 MR. CERULLI: Objection.

6 Form.

7 A. A bit block -- the
8 interpretation of the phrase bit block would
9 be context dependent and the patent provides
10 an example of a bit block and I mapped the
11 bit block of the claimed invention to the
12 transport block marked EDU.

13 Q. So in the context of the '081
14 patent and claim one specifically, what is
15 your understanding of a bit block?

16 A. So the patent explains, for
17 example, at figure two, line 39, it provides
18 an example where the bit block is a
19 transmission block and it goes on to provide
20 more explanation that, for example, the
21 first bit block, which is what we're talking
22 about as the relevant bit block, is
23 subjected to various steps specifically, for
24 example, of what the patent calls circular
25 redundancy check or CRC addition. So the

1 A. Kakaes, Ph.D.

2 addition of a CRC, segmentation, channel
3 coding, rate matching, scrambling,
4 modulation, antenna mapping to form the
5 first radio signal.

6 So the patent very clearly
7 explains it provides an example of what a
8 bit block is and that example and the
9 processing steps as the patent says
10 subjected to steps, those steps are actually
11 also shown in figure 13 of Lee.

12 So the bit block contemplated
13 by the '081 patent is certainly one example
14 of that, is a transfer block 1301 of Lee
15 because 1301 of Lee is a block that's being
16 transmitted, so it's a transmission block
17 and in fact, it didn't have to, but it does
18 undergo several of the steps contemplated
19 for that block in the '081 patent. So
20 clearly, the first bit block, an example of
21 that first bit block is a transfer block MAC
22 PDU of Lee.

23 Q. In figure 13 of Lee, does the
24 transport block -- is the transport block
25 MAC PDU segmented into different code

1 A. Kakaes, Ph.D.

2 blocks?

3 A. It's segmented into as few as
4 one and as many of some number -- capital
5 M -- of code blocks. It may be segmented,
6 it doesn't have to be segmented, but just as
7 the '081 patent contemplates in column two,
8 line 42, I'd say that one of the steps that
9 the bit block can be subjected to is
10 segmentation.

11 So Lee shows that that MAC PDU
12 can be segmented and for example, it could
13 be just segmented into one code block, but
14 can also be segmented into more than one.

15 Q. What is the relationship
16 between the blocks marked coding RM
17 modulation antenna mapping for CW1 and the
18 transport block MAC PDU?

19 A. I'm sorry. Could you repeat
20 that?

21 Q. Sure.

22 What is the relationship
23 between the blocks marked coding RM
24 modulation antenna mapping for CW1 and the
25 transport block MAC PDU?

1 A. Kakaes, Ph.D.

2 A. So if I heard you correctly,
3 you said the block map coding RM, et cetera.
4 Did I hear you correctly?

5 Q. Yes.

6 A. So the word "block" you're
7 using here in at least two different
8 context. The figure showing that
9 rectangle -- that within that rectangle the
10 words coding, RM, modulation, antenna
11 mapping for CW1 appear and if you want to
12 refer to that conceptual rectangle as a
13 block, that's fine with me, but I think it's
14 getting too close to become confusing with
15 the bit block.

16 So since the word "bit block"
17 or the word "block" appears in the phrase
18 "bit block," which is a claim term, I would
19 rather use the phrase "processing" or "steps
20 performed" or something of that sort, rather
21 than using the word "block."

22 Q. That's fine.

23 A. So could you rephrase your
24 question, make sure we have the same
25 understanding of the question?

1 A. Kakaes, Ph.D.

2 Q. Sure.

3 What is the relationship
4 between the rectangle including the words
5 coding RM modulation, antenna mapping for
6 CW1 with the transport block MAC PDU?

7 A. So the transport block MAC PDU
8 is a bit block required by the claim that
9 undergoes several steps of processing. One
10 of those steps of processing is that the
11 bits of that transport block MAC PDU will be
12 encoded, potentially rate matched, modulated
13 and mapped on to antennas for eventual
14 transmission.

15 Q. What is the relationship
16 between the rectangles marked coding, RM,
17 modulation, antenna mapping for CW1 and
18 coding, RM, modulation, antenna mapping for
19 CW2?

20 A. What Lee teaches is that the
21 bit block represented by the transport block
22 MAC PDU undergoes a processing according to
23 the illustration of figure 13, which
24 indicates that some bits are coded, rate
25 matched, modulated and antenna mapped one

1 A. Kakaes, Ph.D.

2 way and other bits are coded, rate matched,
3 modulation, modulated and antenna mapped a
4 different way.

5 So some bits are processed in
6 one way and other bits of that transfer
7 block -- so I should say -- let me rephrase
8 that to make sure I have a complete
9 sentence. Some bits of the transport block
10 MAC PDU are processed one way and other bits
11 of that same transport block MAC PDU are
12 processed a different way and they're also
13 transmitted respectively, some of them are
14 transmitted using a wide beam and others are
15 transmitted using the narrow beam, which is
16 what Lee teaches consistent with what the
17 '081 claims.

18 Q. Just sticking with this figure
19 briefly, is it your testimony that the TTI 1
20 is the claimed first time unit in claim one?

21 MR. CERULLI: Objection.
22 Form.

23 A. So as I explained in my
24 declaration, paragraph 88, the transmission
25 of the properly processed bit block, i.e.

1 A. Kakaes, Ph.D.
2 the transport block MAC PDU takes place over
3 a TTI, over a transmission time interval.
4 Figure 13 does show a TTI.

5 MR. PYMENTO: It's a little
6 less than an hour, but do you guys want
7 to take a ten-minute break?

8 MR. CERULLI: Sure.

9 THE WITNESS: Sure. That's
10 fine.

11 (Time noted: 10:53 a.m.)

12 (Recess taken)

13 (Time noted: 11:06 a.m.)

14 BY MR. PYMENTO:

15 Q. Let's turn to figure four of
16 Chen, which is on the P tab record Exhibit
17 1012. Let me know when you're there.

18 A. I'm sorry. Repeat that. Which
19 document?

20 Q. Chen, which is Exhibit 1012 in
21 the P tab record.

22 A. Okay. You said page four?

23 Q. Figure four.

24 A. Figure four. Sorry.

25 Okay. I am there.

1 A. Kakaes, Ph.D.

2 Q. Does figure four of ten show
3 multi-carrier symbols?

4 A. Figure four does not show what
5 kind of symbols are used, but Chen more
6 broadly does contemplate multi-carrier
7 symbols.

8 Q. Could you point me to where in
9 Chen it disposes multi-carrier symbols?

10 A. Sure. One second. Let me --
11 so Chen on page 11 under the heading of
12 Specific Embodiments, in that second
13 paragraph of that section towards the bottom
14 of the page, Chen states: It should be
15 stated that embodiments of the present
16 disclosure are not limited to specific types
17 of terminals. The base station may be a
18 macro cell, such as LTE, eNodeB, and 5G
19 NR/NB.

20 So a person of ordinary skill
21 in the art reading that would understand
22 that LTE, the long-term evolution system,
23 also known as 4G, and therefore they would
24 understand that both LTE, the eNodeB and the
25 5G new radio refers to the system that uses

1 A. Kakaes, Ph.D.

2 multi-carrier symbols because that's exactly
3 what those systems use.

4 So that Chen contemplates
5 multi-carrier symbols.

6 Q. In your opinion, is that the
7 only reference to multi-carrier symbols in
8 Chen?

9 A. I don't recall all the details
10 in Chen, so I'm not sure if that's the only
11 place, but certainly that is one of the
12 places.

13 Q. Let's turn to claim two of the
14 '081 patent. Let me know when you're there.

15 A. Yes, I'm there.

16 Q. Do you see the term or the
17 claim limitation after the or, receiving
18 third information, wherein the third
19 information is used for determining a
20 candidate scheme for the multi antenna
21 related receiving corresponding to the G
22 multi-carrier symbols?

23 A. Yes, I believe you read that
24 right.

25 Q. What is your understanding of

1 A. Kakaes, Ph.D.

2 the term candidate scheme in that claim?

3 A. So the '081 patent provides an
4 example of what a candidate scheme is.
5 Looking at column six, line 30, the '081
6 patent provides that the -- or explains that
7 the candidate scheme for the multi-antenna
8 related receiving corresponding to the G
9 multi-carrier symbols includes multiple
10 candidate beams used for receiving.

11 So my understanding is that
12 candidate scheme -- I'm sorry.

13 My understanding of the
14 candidate scheme is consistent with what the
15 patent teaches at line, again, column --
16 what was that column? -- six, line 30, which
17 includes candidate beams used for receiving.

18 Q. Is it your testimony that a
19 candidate scheme is any disclosure of which
20 or how many candidate beams are used for
21 receiving multi-carrier symbols?

22 MR. CERULLI: Objection.
23 Form.

24 A. I don't think you characterized
25 my answer correctly, so I don't know if I

1 A. Kakaes, Ph.D.

2 agree or disagree with it, because your
3 characterization is not correct.

4 Q. What would a person of ordinary
5 skill in the art understand to be --
6 understand what a candidate scheme means?

7 A. In the abstract, a person of
8 ordinary skill in the art would not know how
9 to interpret it, would look for the context
10 within which that phrase appears and in the
11 context of the '081 patent specifically, the
12 person of ordinary skill in the art would
13 understand that at least the example
14 provided in this column six, the candidate
15 scheme for multi antenna related receiving
16 corresponding to the G multi-carrier symbols
17 includes multiple candidate beams used for
18 receiving.

19 Q. Is it your opinion that that
20 particular paragraph or line 30 onwards in
21 column six is an example of a candidate
22 scheme?

23 A. It's an example of the '081
24 patent provides.

25 Q. If that section is an example

1 A. Kakaes, Ph.D.

2 of what the '081 patent provides, in your
3 opinion, what is the overall definition or
4 overall understanding of what a candidate
5 scheme is in the context of the '081 patent?

6 MR. CERULLI: Objection.

7 Form and scope.

8 A. I did not need to construe the
9 term candidate scheme for a very simple
10 reason, that whatever the proper
11 construction of that term is, it certainly
12 would include the description in column six,
13 line 30 onward, which is what I've also
14 shown that Lee discloses and therefore Lee
15 discloses at least that embodiment of a
16 candidate scheme. So that was sufficient
17 and I didn't need to go farther than to
18 construe the term as to what it would mean.

19 Q. Could you please turn to
20 paragraph 121 of your declaration?

21 A. Okay.

22 Q. Do you see the last sentence
23 which says: And therefore, Lee's
24 transmission scheme received by the WTRU
25 constitutes the claimed "third information"

1 A. Kakaes, Ph.D.

2 used for determining "a candidate scheme for
3 the multi-antenna related receiving
4 corresponding to the G multi-carrier
5 symbols"?

6 A. Yes, I do.

7 Q. Is it your testimony that the
8 transmission scheme received is the third --
9 discloses the claimed third information?

10 A. Yes, it is and obviously one
11 would have to read that phrase in the
12 context of the paragraphs that are above it,
13 but that is my opinion indeed that Lee
14 discloses the presence of that claimed third
15 information because it provides -- that
16 third information that's disclosed by Lee is
17 used for determining the candidate scheme
18 for the multi-antenna related receiving
19 corresponding to the G multi-carrier symbols
20 as that portion of claim two requires.

21 Q. Is it your testimony that Lee's
22 transmission scheme is used for determining
23 the claimed candidate scheme?

24 MR. CERULLI: Objection.

25 Form.

1 A. Kakaes, Ph.D.

2 A. As I believe I explained, Lee's
3 transmission scheme discloses the reception
4 of the third information by the mobile
5 device or the WTRU or UE -- those are
6 synonymous terms -- that is used for
7 determining a candidate scheme for the
8 multi-antenna related receiving
9 corresponding to the G multi-carrier symbols
10 as claimed -- as I mentioned earlier.

11 Q. Are the terms transmission
12 scheme and candidate scheme as used in that
13 last paragraph of 121 synonymous?

14 MR. CERULLI: Objection.
15 Form.

16 A. I would not say they're
17 synonymous.

18 Q. What is the difference between
19 the two, between transmission scheme and
20 candidate scheme?

21 A. Candidate scheme, for example,
22 is -- it includes multiple antenna beams
23 used for receiving. The transmission scheme
24 discloses the required third information as
25 part of its transmission, but it also

1 A. Kakaes, Ph.D.

2 includes other things. So in that sense,
3 they're not synonymous, they don't mean
4 exactly the same thing.

5 Q. In your opinion, a transmission
6 scheme is a broader term than a candidate
7 scheme? A candidate scheme is a type of
8 transmission scheme?

9 A. I wouldn't characterize it
10 broader or narrower. I would say the
11 candidate scheme is what a patent teaches a
12 candidate scheme to be, which again, the
13 person of ordinary skill in the art would be
14 informed of that by looking at column six,
15 line 30, where the candidate scheme for the
16 multi-antenna related receiving corresponds
17 to the G multi-carrier symbols includes
18 multiple candidate beams used for receiving.

19 So that's what the candidate
20 scheme is and that's how a person of
21 ordinary skill -- at least that's an example
22 of what a candidate scheme is, and the
23 transmission scheme of Lee discloses this
24 limitation and therefore it discloses the
25 presence of the third information as

1 A. Kakaes, Ph.D.

2 claimed.

3 Q. You mentioned earlier that you
4 reviewed the institution decision, which
5 I've marked as Exhibit 5, prior to this
6 deposition briefly.

7 Based on reviewing that
8 decision, did you want to revise anything in
9 your declaration?

10 A. No, I don't know of anything I
11 would want to revise.

12 MR. PYMENTO: I do not have any
13 further questions.

14 MR. CERULLI: Can we take five
15 minutes so I could review my notes?

16 MR. PYMENTO: Sure.

17 (Time noted: 11:28 a.m.)

18 (Recess taken)

19 (Time noted: 11:32 a.m.)

20 EXAMINATION BY

21 MR. CERULLI:

22 Q. So Dr. Kakaes, do you recall
23 being asked earlier about preparation of
24 your declaration?

25 A. Yes, I do.

1 A. Kakaes, Ph.D.

2 Q. And do you recall saying
3 certain edits were made by attorneys?

4 A. I'm sorry. Say it again, a
5 little louder.

6 Q. Do you recall mentioning that
7 certain edits were made by attorneys?

8 A. I forget the exact phraseology
9 I used.

10 Q. Did you agree with these edits?

11 A. Yes. We discussed the edits
12 and I -- to the extent that those edits more
13 accurately, more completely reflected my
14 opinions, I incorporated them in the
15 declaration. As it stands, it reflects my
16 opinions in their entirety.

17 MR. CERULLI: No further
18 questions.

19 (Time noted: 11:33 a.m.)
20
21
22
23
24
25

A C K N O W L E D G M E N T

I, APOSTOLOS KAKAES, Ph.D., hereby
certify that I have read the transcript of my
testimony taken under oath in my examination of
December 22, 2023; that the transcript is a
true, complete and correct record of what was
asked, answered and said during this deposition,
and that the answers on the record as given by
me are true and correct.

APOSTOLOS KAKAES, Ph.D.

Signed and subscribed to
before me, this day of
2024.

Notary Public

CERTIFICATION

I, SARA K. KILLIAN, RPR, RCR, CCR,
do hereby certify that APOSTOLOS KAKAES, Ph.D.,
the witness whose examination under oath
is hereinbefore set forth, was duly sworn,
and that such deposition is a true record
of the testimony given by such witness.

I FURTHER CERTIFY that I am not
related to any of the parties to this
action by blood or marriage, and that
I am in no way interested in the
outcome of this matter.

IN WITNESS WHEREOF, I have
hereunto set my hand this 11th day of
January, 2024.

A handwritten signature in black ink, appearing to read "Sara K Killian". The signature is stylized with a large "S" and "K".

SARA K. KILLIAN, RPR, RCR, CCR

I N D E X

WITNESS	EXAMINATION BY	PAGE
	Mr. Cerulli	42

E X H I B I T S

EXHIBITS	DESCRIPTION	PAGE
Exhibit 1	US Patent No. 10,912,081	6
Exhibit 2	Declaration of Apostolos Kakaes, Ph.D.	6
Exhibit 3	International Patent Publication No. WO 2017/083489	6
Exhibit 4	International Patent Publication No. WO 2018/201861	6
Exhibit 5	Institution Decision Grant	6

ERRATA SHEET
VERITEXT/NEW YORK REPORTING, LLC

CASE NAME: Samsung v Apex
DATE OF DEPOSITION: 12/22/2023
WITNESS' NAME: APOSTOLOS KAKAES, Ph.D.

PAGE/LINE(S) /	CHANGE	REASON
6	-----/-----/-----	-----
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9	-----/-----/-----	-----
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APOSTOLOS KAKAES, Ph.D.

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&	1202 21:18	20001 2:8	7
& 2:5	1203 19:24,25 20:19,22 21:3 21:7,12,15,18 21:20,25 22:11 22:17,23 23:6 23:11,16 25:18 25:22	2017/083489 6:24 46:13 2018/201861 7:3 46:15 2023 1:13 44:7 2024 44:17 45:16 47:21	75 11:25
0	1204 19:24,25 20:19,23 21:4 21:7,12,15,19 21:21 22:2,14 22:17,23 23:7 23:11,20 25:18 25:23	206 2:15 22 1:13 44:7	8
081 10:9 15:7 15:13,15,23 16:3 27:13 28:13,19 29:7 32:17 35:14 36:3,5 37:11 37:23 38:2,5	121 38:20 40:13	3 6:8,23 46:12 30 36:5,16 37:20 38:13 41:15 39 27:17	88 32:24
1	13 26:2 28:11 28:23 31:23 33:4	4	9
1 6:4,17 32:19 46:9 10 8:14,18,19 10,462,767 1:5 10,912,081 6:18 46:9 1004 19:18 1012 33:17,20 10580 2:16 10:00 1:14 10:53 33:11 11 34:11 11:06 33:13 11:28 42:17 11:32 42:19 11:33 43:19 11th 45:15 12 19:17 20:10 24:4 25:11 12/22/2023 47:4 1201 21:17	1301 26:19 28:14,15 132 10:25 11:17 145 11:17 167 20:5 168 20:5,6 21:22 169 20:22 21:16 22:8 19 16:3	3 6:8,23 46:12 30 36:5,16 37:20 38:13 41:15 39 27:17 4 4 6:10 7:2 46:14 411 2:14 42 29:8 46:5 4268 45:19 4g 34:23 5 5 6:12 7:7,22 42:5 46:16 50 9:10,12 5g 34:18,25 6 6 46:9,10,12,14 46:16	a a.m. 1:14 33:11 33:13 42:17,19 43:19 ability 4:16 able 14:19,22 above 39:12 abstract 13:21 14:18,23 15:8 15:10 37:7 accurate 11:5,7 accurately 43:13 acrobat 5:12 action 10:7 45:11 actually 20:5 26:6 28:10 add 11:9 addition 20:9 27:25 28:2 adobe 5:12 agree 24:16 37:2 43:10 agreed 3:4,10 3:15 alcohol 4:16

america 1:7 amount 8:16 analysis 10:16 annotated 5:22 6:2 answer 13:9 14:22 15:11 19:10 36:25 answered 44:9 answers 44:10 antenna 28:4 29:17,24 30:10 31:5,17,18,25 32:3 35:20 36:7 37:15 39:3,18 40:8 40:22 41:16 antennas 31:13 apex 1:10 10:10 47:3 apologize 5:5 11:18 apostolos 1:16 4:11 44:4,13 45:4 46:10 47:4,19 appeal 1:3 appear 30:11 appears 30:17 37:10 appendix 10:24 approximate 8:15 9:8 art 10:11 12:5 13:2,15 14:3	14:13 15:2,17 16:10,16 17:5 18:9 19:5,10 22:25 23:6,24 25:3 27:4 34:21 37:5,8 37:12 41:13 aside 5:10 7:16 9:14 10:4,9 asked 42:23 44:9 aspects 23:12 25:13 associated 20:8 21:17,19 24:20 25:4 attached 10:23 attaching 11:8 attorneys 2:6 2:13 9:14 10:4 10:14 12:16 43:3,7 avenue 2:7,14	21:20 22:11 24:8,8 25:10 25:12,15 32:14 32:15 beams 14:2,11 14:25 21:23 25:21 36:10,17 36:20 37:17 40:22 41:18 believe 7:15 35:23 40:2 binder 26:5 bit 26:14,15,17 27:4,7,8,10,11 27:15,18,21,22 28:8,12,20,21 29:9 30:15,16 30:18 31:8,21 32:25 bits 31:11,24 32:2,5,6,9,10 block 16:15 21:16,18 22:9 22:12 25:14 26:7,14,15,17 26:18,24 27:4 27:7,8,10,11,12 27:15,18,19,21 27:22 28:8,12 28:14,15,16,19 28:20,21,21,24 28:24 29:9,13 29:18,25 30:3 30:6,13,15,16 30:17,18,21	31:6,7,8,11,21 31:21 32:7,9 32:11,25 33:2 blocks 19:22 21:23 24:13 26:10,24 29:2 29:5,16,23 blood 45:11 board 1:3 bottom 26:22 34:13 break 33:7 briefly 32:19 42:6 broad 12:22 broader 41:6 41:10 broadly 34:6
			c
	b 46:7 b1 19:23 20:8 21:3,4,8,9,11 21:12 24:3 b1s 20:2 back 20:11,14 base 34:17 based 42:7 beam 1:10 10:10 18:6,8 20:6 21:17,19		c 2:2 44:2 call 7:4 called 7:7 calls 27:24 candidate 35:20 36:2,4,7 36:10,12,14,17 36:19,20 37:6 37:14,17,21 38:4,9,16 39:2 39:17,23 40:7 40:12,20,21 41:6,7,11,12,15 41:18,19,22 capital 29:4

carried 20:15 20:16 carrier 16:20 34:3,6,9 35:2,5 35:7,22 36:9 36:21 37:16 39:4,19 40:9 41:17 carry 20:11 case 1:4 5:18 7:23 10:12 47:3 ccr 45:3,20 cell 34:18 certain 43:3,7 certainly 28:13 35:11 38:11 certification 3:6 45:2 certified 1:19 certify 44:5 45:4,9 cerulli 2:9 5:3 11:13,19 13:4 13:17 14:15 15:4 17:8 18:11 19:7 21:13 22:4 23:3 27:5 32:21 33:8 36:22 38:6 39:24 40:14 42:14,21 43:17 46:5	cetera 30:3 change 47:5 changes 5:6 channel 16:6,8 16:11 17:11,13 17:18,21,22,24 17:25 18:3,5 18:17,25 28:2 characterizati... 37:3 characterize 41:9 characterized 18:13 24:21 36:24 chat 5:15 check 27:25 chen 7:4,4 33:16,20 34:5 34:9,11,14 35:4,8,10 circular 27:24 circumstances 17:17 cited 7:17 claim 26:16,18 27:14 30:18 31:8 32:20 35:13,17 36:2 39:20 claimed 27:11 32:20 38:25 39:9,14,23 40:10 42:2	claims 32:17 clarification 14:7 clearly 28:6,20 close 30:14 code 22:10,13 22:18,19 23:2 23:16,20,24,25 24:14 25:3 28:25 29:5,13 coded 31:24 32:2 codes 24:19 coding 19:3 20:17 26:10 28:3 29:16,23 30:3,10 31:5 31:16,18 column 16:2 29:7 36:5,15 36:16 37:14,21 38:12 41:14 come 10:17 commission 47:24 communicate 9:20 communicati... 5:13 complete 32:8 44:8 completely 43:13 conceptual 30:12	conference 1:17 confusing 30:14 consecutive 16:14,20 consider 13:2 13:15 14:3,13 15:2,17 17:6 17:15,17 18:9 19:5 23:24 considered 7:16,19 consistent 32:16 36:14 constitutes 18:23 38:25 construction 38:11 construe 38:8 38:18 consult 9:15 contains 22:18 contemplate 34:6 contemplated 28:12,18 contemplates 29:7 35:4 content 12:25 13:12,19,20 15:16 17:4 19:6 context 13:8,23 14:6,21 15:7
--	--	--	--

15:12,15 27:9 27:13 30:8 37:9,11 38:5 39:12 control 20:8,23 21:17,19,20,21 22:11,21 23:7 23:12,19 24:4 conveyed 25:22 copies 5:18,19 5:21,25 correct 12:20 21:8 22:18 23:21 24:23 37:3 44:8,11 correctly 30:2 30:4 36:25 correspond 23:11 corresponded 9:24 corresponding 35:21 36:8 37:16 39:4,19 40:9 corresponds 41:16 counsel 3:5 course 8:11 court 3:18 crc 26:19 27:25 28:2 created 7:24 19:13	creating 7:18 18:15 currently 5:10 cv 10:23 11:3,5 11:9 cw1 26:11 29:17,24 30:11 31:6,17 cw2 31:19	32:24 38:20 42:9,24 43:15 46:10 decode 20:25 24:5 definition 38:3 degree 12:6 depend 13:7 dependencies 15:22 dependent 27:9 depends 15:19 19:11 deposition 1:16 3:7,16 8:3,6,17 9:16,18,21 42:6 44:9 45:7 47:4 described 17:3 20:12 describes 15:24 description 38:12 46:8 detail 20:12,21 details 35:9 determining 35:19 39:2,17 39:22 40:7 device 23:9 40:5 differ 21:4,12 difference 40:18 different 12:24 13:2,12,16	14:2,4,9,11,14 14:25 15:3,15 15:17 17:4,6 17:15,19 18:2 18:8,10,20,22 19:3,3,5,14,16 22:7 23:2,12 23:25 24:12,15 24:19 25:5,7 25:17,19,21 26:24 28:25 30:7 32:4,12 directly 9:21 disagree 37:2 disclosed 39:16 discloses 38:14 38:15 39:9,14 40:3,24 41:23 41:24 disclosure 34:16 36:19 discuss 15:8,12 discussed 13:24 17:22 43:11 disposes 34:9 document 6:17 33:19 documents 5:20 10:11,13 10:16 domain 16:21 downlink 16:6 16:8,11 17:11 17:13 18:17,24 20:23 22:21
---	---	--	---

dr 4:7 7:10 11:24 42:22 draft 12:13 drugs 4:15 dual 20:9 duly 4:3 45:6 dunner 2:5	entire 5:20 12:15 entirety 43:16 equal 13:13 14:9 errata 47:2 esq 2:9,17 et 30:3 eventual 31:13 evolution 34:22 exact 8:13 24:22 43:8 exactly 8:10 35:2 41:4 examination 4:5 42:20 44:6 45:5 46:4 examined 4:3 example 15:23 15:25 16:3,7 16:12,13,18,21 25:15 27:10,17 27:18,20,24 28:7,8,13,20 29:12 36:4 37:13,21,23,25 40:21 41:21 examples 16:23 16:24 except 3:11 exhibit 6:4,6,8 6:10,12,17,20 6:23 7:2,7,22 19:18 33:16,20 42:5 46:9,10	46:12,14,16 exhibits 6:15 46:8 expect 25:3,6 expected 24:14 experience 12:8 expires 47:24 explain 20:21 26:16 explained 21:22 32:23 40:2 explains 20:4,6 21:16 25:11 27:16 28:7 36:6 explanation 27:20 extent 43:12	33:23,24 34:2 34:4 find 11:15 fine 12:17 30:13,22 33:10 finnegan 2:4 4:22 9:15 10:5 firm 4:22 first 4:3 6:17 8:21 16:4,14 16:19 17:22 18:4 22:9,10 23:16,24 26:8 27:21 28:5,20 28:21 32:20 five 17:14,25 42:14 following 20:22 23:10 follows 4:4 21:2 24:6,11 force 3:17 forget 43:8 forgot 24:22 form 3:11 13:5 14:16 15:5 17:9 18:12 19:8 21:14 22:5 23:4,7 27:6 28:4 32:22 36:23 38:7 39:25 40:15 format 13:13
e	e 2:2,2 4:2 44:2 44:2 46:2,7 earlier 21:22 40:10 42:3,23 editing 12:17 edits 43:3,7,10 43:11,12 edu 26:18 27:12 effect 3:17 electrical 12:7 electronics 1:6 1:7 email 5:14 embodiment 38:15 embodiments 34:12,15 employment 11:10,10 enables 24:9 encoded 31:12 engineering 12:7 enodeb 34:18 34:24	f	
	entire 5:20 12:15 entirety 43:16 equal 13:13 14:9 errata 47:2 esq 2:9,17 et 30:3 eventual 31:13 evolution 34:22 exact 8:13 24:22 43:8 exactly 8:10 35:2 41:4 examination 4:5 42:20 44:6 45:5 46:4 examined 4:3 example 15:23 15:25 16:3,7 16:12,13,18,21 25:15 27:10,17 27:18,20,24 28:7,8,13,20 29:12 36:4 37:13,21,23,25 40:21 41:21 examples 16:23 16:24 except 3:11 exhibit 6:4,6,8 6:10,12,17,20 6:23 7:2,7,22 19:18 33:16,20 42:5 46:9,10	46:12,14,16 exhibits 6:15 46:8 expect 25:3,6 expected 24:14 experience 12:8 expires 47:24 explain 20:21 26:16 explained 21:22 32:23 40:2 explains 20:4,6 21:16 25:11 27:16 28:7 36:6 explanation 27:20 extent 43:12	33:23,24 34:2 34:4 find 11:15 fine 12:17 30:13,22 33:10 finnegan 2:4 4:22 9:15 10:5 firm 4:22 first 4:3 6:17 8:21 16:4,14 16:19 17:22 18:4 22:9,10 23:16,24 26:8 27:21 28:5,20 28:21 32:20 five 17:14,25 42:14 following 20:22 23:10 follows 4:4 21:2 24:6,11 force 3:17 forget 43:8 forgot 24:22 form 3:11 13:5 14:16 15:5 17:9 18:12 19:8 21:14 22:5 23:4,7 27:6 28:4 32:22 36:23 38:7 39:25 40:15 format 13:13
	f	f	
	fabricant 2:12 fact 28:17 fair 8:15,18 9:11,13 falls 23:10 farabow 2:4 farther 38:17 field 12:7 figure 19:17,20 19:21,23 20:10 21:8 24:4 25:11 26:2 27:17 28:11,23 30:8 31:23 32:18 33:4,15		

forth 45:6 four 33:15,22 33:23,24 34:2 34:4 frankly 13:6 fremd 2:14 frequency 24:8 25:15,20 full 4:10 12:19 20:11,14 further 3:10,15 42:13 43:17 45:9	h h 46:7 hand 45:15 happening 17:23 happens 17:25 heading 34:11 hear 30:4 heard 30:2 held 1:16 helps 19:19 henderson 2:4 hereinbefore 45:6 hereto 3:6 hereunto 45:15 history 11:10 hour 33:6 hours 8:7,9,12 8:15 9:8,10,12 17:14,25	including 12:9 31:4 incorporated 43:14 indicates 31:24 information 19:15 20:24,24 21:21 22:21 23:7,13 24:5,6 24:7 25:8,21 35:18,19 38:25 39:9,15,16 40:4,24 41:25 informed 41:14 informs 23:8 initial 4:11 input 12:10,17 instance 18:25 instances 18:2 24:3 institution 7:5 7:7,23 42:4 46:16 interested 45:12 international 6:23 7:2 46:12 46:14 interpret 14:18 37:9 interpretation 27:8 interval 33:3 invention 27:11	involved 8:22 10:5 involves 26:23 ipr 6:22 7:6 8:22 9:25 ipr2023-00598 1:4 item 26:19
g	i		j
g 16:19 35:21 36:8 37:16 39:4,19 40:9 41:17 44:2 garrett 2:5 general 12:23 getting 30:14 give 14:20 given 44:10 45:8 go 38:17 goes 20:20 27:19 going 9:18 16:2 goldberg 5:5 good 4:7,10 grant 46:16 granting 7:23 guys 33:6	i.e. 32:25 identification 6:5,7,9,11,13 ids 24:8 25:15 illustration 31:23 impair 4:16 imply 13:19 include 38:12 includes 36:9 36:17 37:17 40:22 41:2,17		january 45:16 julian 2:17 11:13
			k
			k 1:18 4:2,2,11 44:2 45:3,20 kakaes 1:16 4:7 4:11 5:1 6:1,20 7:1,10 8:1 9:1 10:1 11:1,24 12:1 13:1 14:1 15:1 16:1 17:1 18:1 19:1 20:1 21:1 22:1 23:1 24:1 25:1 26:1 27:1 28:1 29:1 30:1 31:1 32:1 33:1 34:1 35:1 36:1 37:1 38:1 39:1 40:1 41:1 42:1,22 43:1 44:4,13 45:4 46:11 47:4,19 killian 1:18 45:3,20

kind 17:23 34:5 know 5:7 7:12 10:18,25 11:4 13:21 15:9 19:10,15,19 26:2 33:17 35:14 36:25 37:8 42:10 knowing 19:13 known 34:23	llp 2:5,12 located 4:19 10:12 25:19 location 24:9 locations 25:16 long 34:22 look 10:22 11:3 26:6 37:9 looking 36:5 41:14 louder 43:5 lower 20:16 lte 34:18,22,24	31:16 42:5 marriage 45:11 master's 12:6 matched 31:12 31:25 32:2 matching 28:3 material 7:19 materials 7:16 7:17,20 matter 9:19 45:13 mcs 20:17 mean 9:17 14:6 15:9 22:7 38:18 41:3 means 13:21 37:6 meant 11:17 mechanism 20:14 meeting 5:11 mentioned 40:10 42:3 mentioning 43:6 middle 4:11 mimo 12:10 minute 33:7 minutes 42:15 misinterpreting 17:20 mispronounc... 5:4 mobile 23:9 40:4	modulated 31:12,25 32:3 modulation 19:3,14 20:17 26:11 28:4 29:17,24 30:10 31:5,17,18 32:3 months 8:24 morning 4:7,10 multi 16:20 34:3,6,9 35:2,5 35:7,20,22 36:7,9,21 37:15,16 39:3 39:4,18,19 40:8,9 41:16 41:17 multiple 12:10 12:10 36:9 37:17 40:22 41:18
l	m		n
l 4:2 44:2 language 12:18 law 4:22 lee 6:25,25 19:17 26:2 28:11,14,15,22 28:23 29:11 31:20 32:16 38:14,14 39:13 39:16 41:23 lee's 38:23 39:21 40:2 left 26:8 limitation 35:17 41:24 limited 34:16 line 16:3,13 27:17 29:8 36:5,15,16 37:20 38:13 41:15 47:5 little 33:5 43:5 llc 47:2	m 29:5 44:2 mac 28:21,25 29:11,18,25 31:6,7,11,22 32:10,11 33:2 macro 34:18 made 43:3,7 make 18:15 30:24 32:8 map 26:18 30:3 mapped 22:9 22:12 27:10 31:13,25 32:3 mapping 26:11 28:4 29:17,24 30:11 31:5,17 31:18 marked 6:5,7,9 6:11,13,14 7:22 19:23,24 27:12 29:16,23		n 2:2 44:2,2 46:2 name 4:8,10 5:4 47:3,4 narrow 25:12 32:15 narrower 41:10 nb 34:19 necessarily 15:19

need 13:22 14:5 22:6 26:3 38:8 38:17 needed 20:25 24:5 25:13 new 2:7,16 34:25 47:2 nicholas 2:9 notary 1:19 3:17 44:19 47:23 noted 21:3,4,7 21:11,12 26:10 33:11,13 42:17 42:19 43:19 notes 6:2 42:15 nr 34:19 number 8:13 9:8 29:4 nw 2:7	offer 14:19 office 1:2 4:22 7:24 oh 8:23 okay 12:2 24:24 25:25 33:22,25 38:21 once 15:10 ones 10:18 onward 38:13 onwards 37:20 open 5:14 7:10 7:13 opinion 12:4 14:20 27:2 35:6 37:19 38:3 39:13 41:5 opinions 43:14 43:16 ordinary 12:5 12:25 13:14 14:3,12 15:2 15:16 16:9,16 17:5 18:9 19:4 19:9 22:25 23:5,23 25:2 27:3 34:20 37:4,8,12 41:13,21 outcome 45:13 outlook 5:14 output 12:10 overall 27:2 38:3,4	own 10:17,19 owned 10:10 owner 1:11 2:13	28:6,9,13,19 29:7 35:14 36:3,6,15 37:11,24 38:2 38:5 41:11 46:9,12,14 pdf 10:24 11:17 pdsch 18:5,7 pdu 28:22,25 29:11,18,25 31:6,7,11,22 32:10,11 33:2 pending 11:21 performed 30:20 person 12:4,25 13:14 14:2,12 15:2,16 16:9 16:15 17:5,14 18:8 19:4,9 22:24 23:5,23 25:2 27:3 34:20 37:4,7 37:12 41:13,20 petitioners 1:8 2:6 ph.d. 1:16 4:2 5:1 6:1 7:1 8:1 9:1 10:1 11:1 12:1 13:1 14:1 15:1 16:1 17:1 18:1 19:1 20:1 21:1 22:1 23:1 24:1 25:1 26:1 27:1 28:1 29:1
o		p	
o 4:2,2,2 44:2 oath 44:6 45:5 objection 13:4 13:17 14:15 15:4 17:8 18:11 19:7 21:13 22:4 23:3 27:5 32:21 36:22 38:6 39:24 40:14 objections 3:11 obviously 16:5 39:10		p 2:2,2 4:2 19:18 33:16,21 page 10:24 11:14 26:22 33:22 34:11,14 46:4,8 47:5 paper 5:17 paragraph 11:25 20:4,6 20:22 21:16,22 22:8 32:24 34:13 37:20 38:20 40:13 paragraphs 39:12 part 26:22 40:25 particular 37:20 parties 3:5 45:10 parts 18:18,19 past 8:11 patent 1:2,3,5 1:11 2:13 6:18 6:19,24 7:3,24 10:9,10 15:7 15:13,15,24 16:3,4,13,18,25 27:9,14,16,24	

30:1 31:1 32:1 33:1 34:1 35:1 36:1 37:1 38:1 39:1 40:1 41:1 42:1 43:1 44:4 44:13 45:4 46:11 47:4,19 phrase 27:8 30:17,19 37:10 39:11 phraseology 43:8 physical 5:17 5:19,21,25 16:6,7,11 17:11,13,24 18:16,24 physically 4:20 place 17:12,14 33:2 35:11 places 25:19 35:12 please 5:7 7:10 10:22 11:24 25:25 38:19 point 34:8 portion 20:25 39:20 portions 25:8 25:14,23 posa 12:5 potentially 31:12 premise 24:16	preparation 8:3 10:6 42:23 prepared 8:12 preparing 8:6 8:16 9:3,11 presence 39:14 41:25 present 34:15 prior 9:25 10:11 42:5 probably 23:2 proceeding 6:19 7:11 8:22 9:4 10:2 processed 32:5 32:10,12,25 processing 26:20,23 28:9 30:19 31:9,10 31:22 professional 1:18 program 5:10 5:15,15 programs 5:9 5:14 proper 38:10 properly 32:25 provide 9:7 19:14 20:23 21:21 22:19 24:7 25:7 27:19 provided 10:15 21:25 22:2,2	22:10,13 37:14 provides 22:20 23:16,20 24:4 27:9,17 28:7 36:3,6 37:24 38:2 39:15 public 1:19 3:17 44:19 47:23 publication 6:24 7:3 46:12 46:14 pymento 2:17 4:6 6:14 7:9 11:16,22,23 33:5,14 42:12 42:16	16:5,7,12,14,19 16:22,25 17:12 17:18 18:4,7 18:14,16,17,18 18:20,24 19:2 28:5 34:25 rate 28:3 31:12 31:24 32:2 rather 30:19,20 rcr 45:3,20 reach 19:19,21 read 6:16 8:4 35:23 39:11 44:5 reading 34:21 realtime 1:19 reason 4:12 38:10 47:5 recall 8:21 35:9 42:22 43:2,6 receive 23:9 25:13 received 13:25 14:10,25 18:19 18:20,21,23 38:24 39:8 receiving 23:8 35:17,21 36:8 36:10,17,21 37:15,18 39:3 39:18 40:8,23 41:16,18 reception 24:10 40:3
		q	
		question 3:12 11:20 13:7,19 14:17,18,23 19:11 21:6 23:15 24:17 30:24,25 questions 12:23 42:13 43:18 quick 8:4 quickly 11:4 quite 8:25	
		r	
		r 2:2 radio 14:24 15:6,9,13,14,20 15:24,25 16:4	

recess 33:12 42:18 record 4:9 5:18 5:20 6:16 19:18 33:16,21 44:8,10 45:7 rectangle 30:9 30:9,12 31:4 rectangles 31:16 redundancy 27:25 refer 6:25 30:12 reference 35:7 referred 26:25 referring 11:14 19:12 refers 22:24 34:25 reflected 43:13 reflects 43:15 regarding 9:25 24:7 registered 1:18 related 35:21 36:8 37:15 39:3,18 40:8 41:16 45:10 relationship 29:15,22 31:3 31:15 relatively 13:11 relevant 26:17 27:22	relied 7:20,20 remember 8:10 8:13,23,25 9:5 9:9 10:20 remotely 1:17 repeat 29:19 33:18 rephrase 24:25 30:23 32:7 reporter 1:18 1:19 reporting 47:2 represented 31:21 representing 25:24 required 31:8 40:24 requires 39:20 reserved 3:12 resource 25:16 resources 25:20 respect 12:19 13:14 respective 3:5 21:23 22:22,24 25:14,23 respectively 32:13 respond 22:20 reston 4:21 review 42:15 reviewed 8:2 42:4	reviewing 42:7 revise 42:8,11 right 4:19 11:16 23:17,20 35:24 rm 26:10 29:16 29:23 30:3,10 31:5,16,18 room 4:23 rotate 26:3,5 rpr 45:3,20 running 5:10 rye 2:16 s s 2:2 4:2,2,2 46:7 47:5 samsung 1:6,7 9:21,25 47:3 sara 1:17 45:3 45:20 saying 43:2 says 12:4 22:8 28:9 38:23 scheme 20:10 20:17 35:20 36:2,4,7,12,14 36:19 37:6,15 37:22 38:5,9 38:16,24 39:2 39:8,17,22,23 40:3,7,12,12,19 40:20,21,23 41:6,7,7,8,11 41:12,15,20,22 41:23	schemes 19:4 scope 38:7 scrambling 28:3 se 9:19 sealing 3:6 second 22:12 22:13 23:20,25 26:9 34:10,12 section 11:11 12:13 34:13 37:25 see 12:3,12 19:22,25 22:15 22:16 24:24 26:7,12 35:16 38:22 segmentation 28:2 29:10 segmented 28:25 29:3,5,6 29:12,13,14 sense 18:16 41:2 sentence 12:3 32:9 38:22 set 45:6,15 several 8:7,8,12 8:24 28:18 31:9 share 19:6 shared 16:6,8 16:11 17:11,13 17:24 18:25
--	---	---	---

sheet 47:2 short 20:19 show 33:4 34:2 34:4 showing 20:3 30:8 shown 20:10 24:4 28:11 38:14 shows 29:11 side 26:8 signal 13:16 15:20 16:4,5,7 16:12,14,17,19 16:22,25 17:12 17:18 18:4,7 18:14,16,18,18 18:21,24 19:16 19:16 20:7 25:24 28:5 signals 12:23 12:24 13:2,8 13:12,16,19,20 13:23,25 14:4 14:4,6,8,8,10 14:13,14,21,24 15:3,3,6,9,13 15:14,17,18,24 15:25 17:2,4,6 17:7,10 18:10 19:2,5,6,12 signature 45:19 signed 3:16,18 44:15	similar 12:7 simple 13:11 38:9 six 21:8 36:5,16 37:14,21 38:12 41:14 skill 12:5,25 13:15 14:3,13 15:2,16 16:9 16:16 17:5 18:9 19:4,9 22:25 23:5,24 25:3 27:3 34:20 37:5,8 37:12 41:13,21 sorry 5:23 11:13,20 29:19 33:18,24 36:12 43:4 sort 12:22 30:20 sound 24:23 south 2:15 specific 13:22 14:20 24:8 25:13,17 34:12 34:16 specifically 10:21 27:14,23 37:11 spend 8:6 9:3 spent 8:16 9:10 stands 43:15 state 4:8	stated 34:15 states 1:2 34:14 station 34:17 steps 26:20 27:23 28:9,10 28:10,18 29:8 30:19 31:9,10 sticking 32:18 stipulated 3:4 3:10,15 stipulations 3:2 structure 25:7 subject 6:19 9:19 subjected 27:23 28:10 29:9 submitted 6:21 7:25 subscribed 44:15 47:20 subset 20:15 successful 24:10 successfully 24:5 sufficient 19:15 38:16 sufficiently 14:19 suite 2:15 sure 8:19 21:5 23:14 29:21 30:24 31:2 32:8 33:8,9	34:10 35:10 42:16 sworn 3:18 4:3 45:6 47:20 symbols 16:20 34:3,5,7,9 35:2 35:5,7,22 36:9 36:21 37:16 39:5,19 40:9 41:17 synonymous 40:6,13,17 41:3 system 34:22 34:25 systems 12:9 35:3
			t
			t 4:2 44:2 46:7 tab 19:18 33:16 33:21 take 10:22 11:3 33:7 42:14 taken 4:15 33:12 42:18 44:6 takes 17:11,13 33:2 talking 27:21 tandem 16:15 tb 20:9 tb1 20:15,16 24:13,18,21 25:4,8,9,18,24

tb2 20:7,8,16 20:18 24:13,18 24:22 25:4,8 25:11,18,24 teaches 15:24 16:4,13,19,25 31:20 32:16 36:15 41:11 technologies 1:10 technology 12:11 telecommuni... 12:9 tell 10:11 ten 8:14 33:7 34:2 tenor 26:11 term 15:13 26:15 30:18 34:22 35:16 36:2 38:9,11 38:18 41:6 terminals 34:17 terms 40:6,11 testified 4:4 testify 4:13,17 testimony 32:19 36:18 39:7,21 44:6 45:8 theodore 2:14 thing 14:9 41:4	things 41:2 think 8:18 9:12 11:4,6 13:9 23:21 24:21 30:13 36:24 third 35:18,18 38:25 39:8,9 39:14,16 40:4 40:24 41:25 tilted 26:2 time 3:12 8:5 8:16,25 9:2 11:8 16:20 17:19 24:8 25:15,19 32:20 33:3,11,13 42:17,19 43:19 titled 19:23 today 4:13,17 9:16,22,25 told 9:17 took 26:4 towards 34:13 trademark 1:2 transcript 44:5 44:7 transfer 21:18 26:18 28:14,21 32:6 transmission 16:15 20:10,12 21:2,24 22:11 22:13 23:19 25:9 26:8,9,9 27:19 28:16	31:14 32:24 33:3 38:24 39:8,22 40:3 40:11,19,23,25 41:5,8,23 transmitted 17:18 18:5,6,7 18:17 20:7 25:10,12 26:21 28:16 32:13,14 32:15 transport 21:16 22:9,12 27:12 28:24,24 29:18,25 31:6 31:7,11,21 32:9,11 33:2 trial 1:3 3:13 true 44:8,11 45:7 truthfully 4:13 trying 11:15 tti 23:10 24:6 26:21 32:19 33:3,4 tuning 12:17 turn 11:25 19:17 25:25 33:15 35:13 38:19 two 12:8,24 13:11,25 14:24 15:14 16:2 17:3 18:2,21 19:2,12,22	24:3,12 25:8 27:17 29:7 30:7 35:13 39:20 40:19 tx 21:17,19,20 type 41:7 types 17:4 34:16
u			
u.s. 1:5 ue 40:5 ultimately 26:21 under 34:11 44:6 45:5 undergo 28:18 undergoes 26:20 31:9,22 understand 13:6,10,18 16:10,17 21:5 22:6,25 23:6 23:14 27:4 34:21,24 37:5 37:6,13 understanding 26:13 27:15 30:25 35:25 36:11,13 38:4 unit 32:20 united 1:2 use 20:16 30:19 35:3 used 15:6 20:11 21:23 24:23			

25:16 26:15 34:5 35:19 36:10,17,20 37:17 39:2,17 39:22 40:6,12 40:23 41:18 43:9 uses 34:25 using 14:2,11 14:25 17:2 18:8 25:10,12 25:20 30:7,21 32:14,15	whereof 45:14 whichever 18:22 wide 25:10 32:14 wife 9:17 witness 33:9 45:5,8,14 46:4 47:4 wo 6:24 7:3 46:12,14 word 22:10,13 22:18,19 23:17 23:20,25 24:2 30:6,16,17,21 wording 24:22 words 23:2 24:14,19 25:3 30:10 31:4 working 10:15 12:8 worries 11:19 wtru 38:24 40:5	z zoom 1:17 5:11
v		
v 47:3 value 20:17 values 25:17 various 26:20 26:23 27:23 veritext 47:2 video 1:17 virginia 4:21		
w		
w 44:2 waived 3:8 want 30:11 33:6 42:8,11 washington 2:8 way 18:13,19 18:20,22,23 32:2,4,6,10,12 45:12 ways 18:22	x x 1:6,12 46:2,7 y year 8:24 years 12:8 york 2:7,16 47:2	

Federal Rules of Civil Procedure

Rule 30

(e) Review By the Witness; Changes.

(1) Review; Statement of Changes. On request by the deponent or a party before the deposition is completed, the deponent must be allowed 30 days after being notified by the officer that the transcript or recording is available in which:

(A) to review the transcript or recording; and

(B) if there are changes in form or substance, to sign a statement listing the changes and the reasons for making them.

(2) Changes Indicated in the Officer's Certificate. The officer must note in the certificate prescribed by Rule 30(f)(1) whether a review was requested and, if so, must attach any changes the deponent makes during the 30-day period.

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