



Transcript of Douglas A. Chrissan, Ph.D.

Date: June 25, 2024

Case: Cellco Partnership -v- General Access Solutions, Ltd. (PTAB)

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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

Verizon Exhibit 1024
Verizon v. GAS IPR2023-00978

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD

4
5 CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS,

6 Petitioner,

7 v.

8 GENERAL ACCESS SOLUTIONS, LTD.,

9 Patent Owner.

10
11 Case IPR2023-00978

12 U.S. Patent No. 7,230,931

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14
15 DEPOSITION OF DOUGLAS A. CHRISSAN, PH.D.

16 Conducted Virtually

17 Tuesday, June 25, 2024

18 11:00 a.m. EDT

19
20 Job No.: 542577

21 Pages: 1 - 205

22 Reported by: Monique Vouthouris, CCR, RPR, CRR

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REMOTE DEPOSITION OF DOUGLAS A. CHRISSAN,
PH.D. pursuant to notice, conducted virtually via
Zoom Videoconference, before Monique Vouthouris,
Certified Court Reporter, Registered Professional
Reporter, Certified Realtime Reporter, and Notary
Public in and for the States of New Jersey and
New York.

A P P E A R A N C E S

ON BEHALF OF THE PETITIONER

CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS:

JUSTIN J. OLIVER, ESQ.

VENABLE LLP

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ON BEHALF OF THE PATENT OWNER

GENERAL ACCESS SOLUTIONS, LTD.:

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C O N T E N T S

EXAMINATION OF DOUGLAS A. CHRISSAN, PH.D.	PAGE
By Mr. Oliver	5

E X H I B I T S

(No exhibits were marked.)

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

2

3 DOUGLAS A. CHRISSAN, PH.D.

4 being first duly sworn or affirmed by the Notary,
5 testifies as follows:

6 EXAMINATION

7 BY MR. OLIVER:

8 Q Good morning, Dr. Chrissan. How are you
9 today?

10 A I am good. Good morning.

11 Q I just want to go through a few procedural
12 steps first.

13 Is there any reason you cannot give
14 truthful testimony today?

15 A Not that I know of.

16 Q You're not taking any medication that
17 would affect your ability to give truthful
18 testimony?

19 A That is correct, I am not.

20 Q I'll endeavor to take a break for all of
21 us about every hour. If you need a break at some
22 time before I have called one, that's fine, just let

1 me know. The only thing I would ask is that if
2 there's a question pending, that you answer the
3 question. Is that fair?

4 A Understood.

5 Q Okay. And you also understand that your
6 attorney may object during this deposition, but
7 absent an assertion of privilege, you still must
8 answer all the questions.

9 Do you understand that?

10 A Yes, I understand that.

11 Q I'll try to be clear with my questions
12 today. But if for some reason you don't understand
13 one of my questions, please feel free to ask for
14 clarification and I'll provide it to the best I can.
15 Okay?

16 A Yes, I will do that.

17 Q Have you been deposed before?

18 A Yes, I have.

19 Q About how many times?

20 A Approximately 20.

21 Q And how did you prepare for today's
22 deposition?

1 A I read many of the case documents,
2 including the exhibits in the 1000 range, the
3 exhibits in the 2000 range, Dr. Almeroth's
4 declaration, which is one of those exhibits, my own
5 declaration. I also read Dr. Almeroth's deposition
6 transcript.

7 I met with Ms. -- well, I didn't meet.
8 Ms. Spires and I had a conference call on Friday
9 morning, and we had a conference call yesterday
10 morning to discuss this deposition.

11 Q Other than the two conference calls with
12 Ms. Spires, did you meet with anybody else
13 concerning your deposition?

14 A No, I did not meet with or talk to anyone
15 else. I prepared with Ms. Spires.

16 Q Okay. And since we're doing this
17 remotely, I would just like to clear up a few
18 things. Do you have any notes with you in front of
19 you today?

20 A No, I do not.

21 Q Do you have any documents in front of you
22 today?

1 A No, I do not. And my screen is clear
2 except for this Zoom window.

3 Q Okay. And you have downloaded the
4 documents that I provided in the -- in the link,
5 correct?

6 A Yes, I have. They are in a folder on my
7 desktop unpacked, so I should be able to refer to
8 any of them that you wish without delay.

9 Q What I would like to do, just to start
10 off, is take care of a little of housekeeping and
11 just go through a few of those. So if you could
12 open that folder up, please.

13 A Yes.

14 Q And you'll see one of the documents is
15 your exhibit, which I believe is Exhibit 2028, can
16 you open that, please?

17 A Yes, I have it open.

18 Q And can you confirm that that is your
19 declaration in this matter?

20 A Yes, it is my declaration. I assume it is
21 unaltered.

22 Q And I'm going to refer to that today as

1 your declaration. All right?

2 A Understood.

3 Q And another one of the files that I
4 provided is Exhibit 1001. Can you open that
5 document?

6 A Yes, I am looking at it.

7 Q And I'll refer to that today as the '931
8 patent. All right?

9 A Understood.

10 Q And if you want to open Exhibit 1004 as
11 well.

12 A I have it open.

13 Q And you're familiar with this as the
14 Vornefeld document, correct?

15 A Yes, I am.

16 Q Okay. And I'll refer to that today as
17 Vornefeld.

18 A Understood.

19 Q Great. If you want to open Exhibit 1005,
20 please.

21 A I have it open.

22 Q And that's U.S. Patent Number 6,160,800,

1 correct?

2 A Yes.

3 Q And I'll refer to that today as Atsuta.

4 A Understood.

5 Q And if you could open up Exhibit 1006,
6 please.

7 A Yes.

8 Q And that is U.S. Patent Number 6,154,661,
9 correct?

10 A Yes, it is.

11 Q And I'll refer to that today as Goldberg.
12 All right?

13 A Understood.

14 Q And there's some other documents there;
15 we'll get to those as needed. So we'll start with
16 what we've already gone over.

17 Just a few issues upfront for clarity. I
18 will generally be asking questions here today from
19 the perspective of a person of ordinary skill in the
20 art. So if I don't otherwise specify whether I'm
21 asking something specific to your knowledge or
22 specify something to the alternative, assume that my

1 questions are directed to what the person of
2 ordinary skill in the art would have understood.

3 Is that all right?

4 A Understood.

5 Q If you could look at the '931 patent,
6 claim 1 refers to wireless access devices. Are you
7 familiar with that?

8 MS. SPIRES: Object to form.

9 A I'm looking at claim 1. It starts with
10 "For use in a wireless access network." Is that
11 what you are referring to -- oh, you said "wireless
12 access device"?

13 Q Yeah, if you look at column 30, line 45,
14 there's a reference to wireless access devices.

15 A Right.

16 Q And what's your understanding of what
17 wireless access devices are?

18 A I think that the claim describes it.
19 Let's go back to the preamble and I will read that.
20 "For use in a wireless access network comprising a
21 plurality of base stations, each of said plurality
22 of base stations capable of bidirectional time

1 division duplex communication with wireless access
2 devices."

3 So this is not my final answer. I would
4 want to study the whole patent. But at least a
5 wireless access device is a device that communicates
6 with a base station.

7 Q So this could be a user device or a
8 subscriber device that communicates with a base
9 station?

10 MS. SPIRES: Object to form.

11 A Thank you for providing a searchable
12 exhibit. Let me take a minute and search through
13 the patent for wireless access device.

14 I don't see that the '931 patent defines
15 it other than what is -- other than what is in the
16 claim. So from the person of skill's standpoint, I
17 think a wireless subscriber device is likely to be
18 an example of that.

19 Q So I'll likely refer today to access
20 devices or subscriber devices. To the extent I use
21 either of those terms, I'm referring to the type of
22 device that would fall within the term "wireless

1 access device" of claim 1. All right?

2 A Okay.

3 Q So as you know, the term "frame" is at
4 issue in this case. Can you explain to me what a
5 frame is?

6 A Frame is such a broad term within
7 communications that I would not want to attempt a
8 general answer. There's -- we can look through the
9 '931 patent for examples of frames that would apply.

10 We can also look through the extrinsic
11 evidence, one of the exhibits I believe is
12 Rappaport, and that's an excellent textbook. We can
13 also -- Newton's, Newton's is in here, we can open
14 Newton's telecom and see what it has to say about
15 frame.

16 But I, answering as a person of skill,
17 would want to answer that question with respect to a
18 specific system.

19 Q So let me ask this. Is a frame known to
20 be sort of a structure of data?

21 A Well, Newton's -- I'm looking at Exhibit
22 1021, Newton's on page 7 out of 10, it has a long

1 definition of a frame, that would be my -- that's a
2 good example of an extrinsic evidence-based answer
3 from the point of a person of skill.

4 If you want -- I know you're the one
5 that's supposed to tell me to open exhibits, but if
6 you want to open Exhibit 1021, Newton's Telecom at 7
7 out of 10, page 7 of 10, it gives a long definition,
8 oh, my gosh, it goes on for more than one whole
9 column.

10 So that corroborates what I was saying.
11 "Frame" is a very general term in telecommunications
12 that can mean a lot of different things. If you
13 have any particular questions about a frame, we can
14 focus on this definition in Newton's or on the use
15 of a frame in one of the particular documents.

16 Q Okay. You're familiar with Newton's,
17 then, I take it?

18 A I've used it before. I know of it.

19 Q How does a person of ordinary skill decide
20 how to structure a frame in the context of
21 telecommunications, let's say?

22 A I have to smile a little bit because I

1 could spend days, if not weeks, explaining that
2 question.

3 I'm thinking of the telecommunications
4 systems I've designed. I mean, it starts with a
5 business requirements document, and then flows into
6 endless engineering specification documents. And
7 then you decide how you're going to design a system,
8 and you decide if it's going to use -- be protocol
9 or standards-based or proprietary, and which pieces
10 are which.

11 And ultimately, it flows down into a set
12 of engineering specifications from an engineering
13 team that's responsible for the system design. And
14 from that, you know, ultimately the low level
15 details of a communication system will be defined,
16 including the framing.

17 Q Can a frame have both TDMA and TDD
18 information?

19 A I can't answer that question as stated
20 because I don't know what you mean by TDMA and TDD
21 information.

22 Certainly if we look at the '931 patent,

1 that has good examples and explanations that I think
2 you can address your question to.

3 Q Well, let me ask this. Can a frame be a
4 combined TDMA/TDD frame?

5 A I think it's better to use the wording
6 that's in the '931 patent. I think the '931 patent
7 explains that a system can employ both of those
8 schemes, methods, protocols.

9 Does that answer your question?

10 Q Okay. If one employs both methods, would
11 you call it a TDD frame? A TDMA frame? Or would
12 you call it a TDMA/TDD frame?

13 A I would not try to use a one size fits
14 all -- I would be careful using a one size fits all
15 nomenclature.

16 But, again, referring to the '931 patent
17 itself, it does talk -- let me search. I'm looking
18 at one instance of TDD/TDMA, but let me find them
19 all.

20 The '931 patent has two instances of the
21 quote -- of the term "TDD/TDMA." It talks about a
22 TDD/TDMA access technique. It talks about a

1 TDD/TDMA system. So I think that's the nomenclature
2 that I would use.

3 But ask your question again. Let me make
4 sure I answered it.

5 Q Well, let's take a look for context at
6 Exhibit 2022.

7 A Okay. Rappaport.

8 Q And this is the document that you cited to
9 in your declaration, and I direct your attention to
10 page 401 of that reference.

11 A Yes, I am looking at it.

12 Q And there's a Post-It note, it looks like,
13 that's on there that refers to a TDMA frame
14 preamble, correct?

15 A Yes. I must admit, I have no idea where
16 that Post-It note came from or whether it means
17 anything to me.

18 Q Okay. Is that your handwriting?

19 A No.

20 Q Okay. It refers there, separately from
21 the Post-It note on that page, on the paragraph
22 right after the figure, a TDMA frame, correct?

1 A You mean the paragraph that starts "In a
2 TDMA frame"?

3 Q Yes.

4 A Yes, I'm reading it.

5 Q All right.

6 A Go ahead.

7 Q So my question is something can be
8 referred to as a TDMA frame, correct?

9 A Yes.

10 Q And what would that mean? Specifically
11 what would that tell you about the structure of the
12 frame?

13 A I'll go back to one of my original
14 comments. TDMA frame can mean different things in
15 different systems. In this -- it's Rappaport
16 probably defines it. Let's go -- one example is
17 certainly Figure 8.3. But if we go up to page 9 out
18 of 13, Section 8.3 where Rappaport starts the
19 section TDMA, it says -- well, you can read it. I
20 don't need to recite it.

21 But, let's see. No, I'll start from the
22 top for the record. "Time division multiple access

1 systems divide the radio spectrum into time slots,
2 and in each slot only one user is allowed to either
3 transmit or receive. It can be seen from Figure 8.3
4 that each user occupies a cyclically repeating time
5 slot, so a channel may be thought of as particular
6 time slot that reoccurs every frame, where N time
7 slots comprise a frame."

8 So that's one interpretation and I've seen
9 others. But they're somewhat similar.

10 From a person of skill's standpoint, TDMA
11 means that a frame comprises a chunk of time, and
12 that frame is somehow divided up into slots, and in
13 a given slot only one device uses that slot and
14 that's what gives you the multiple access.

15 Q So when you say "multiple access," that
16 term refers to multiple different devices being able
17 to access communication with, for instance, a base
18 station, correct?

19 A Yes, at least the ability for that.

20 Q And when the term "duplexing" appears,
21 that refers to how the uplink and downlink is
22 divided for communications with, for instance, one

1 specific device. Is that fair?

2 A That -- that sounds right. But I will
3 again refer to -- since we're talking about the '931
4 patent specifically, and some of these telecom terms
5 are very general, I would prefer to -- I would
6 prefer to use the definition in the '931 patent,
7 which is also the definition I use in my declaration
8 for TDMA and TDD. We can look at those if you want.

9 Q So just so we're clear, do you think the
10 '931 patent provides a definition of TDD that may be
11 different than the general definition in the field?

12 A Allow me to look at the '931. The '931's
13 explanation of TDD, at least the first one I found,
14 which I believe is definitive, is the '931 at column
15 6, line 2, where it says, "In TDD, a single channel
16 is used for transmission and reception and specific
17 periods of time (i.e., slots) are allocated for
18 transmission and other specific periods of time are
19 allocated for reception."

20 I think that's a -- I think that is a
21 valid interpretation of TDD, especially in light of
22 the '931 patent, it says i.e. slots, in parentheses.

1 There are TDD systems that are not rigidly defined
2 by slots. I think the '931 patent gives an example
3 of that 802.11 WiFi.

4 But for the purposes of this patent and
5 this matter, yeah, I think that definition of TDD is
6 fine.

7 Q Just for clarity, we also have to consider
8 what a person of ordinary skill in the art would
9 have understood right before the filing of the '931
10 patent. So let me ask something from that
11 perspective.

12 Before someone could even see the '931
13 patent, you know, the hour before it was filed, a
14 person of ordinary skill in the art would understand
15 that there are different duplexing methods, such as
16 TDD and FDD, correct?

17 A Yes, that is correct.

18 Q And also, a person of ordinary skill would
19 have understood that there are different multiple
20 access methods, such as TDMA and FDMA, correct?

21 A Yes, that's correct.

22 Q And would it also be fair to say that in

1 multiple access methods, the issue being addressed
2 is how to communicate with different devices,
3 correct?

4 MS. SPIRES: Object to form.

5 A I would word it -- I see where you're
6 going, but I would word it a little differently.

7 Again, if we're talking the extrinsic
8 evidence, we have great extrinsic evidence in front
9 of us, Exhibit 2022, Rappaport, so we can use that
10 definition. I'm looking at page 4 out of 13, native
11 395, where it says, "Time division duplexing uses
12 time instead of frequency to provide both a forward
13 and reverse link." So we can use that one if you
14 want. I think that's along the lines of what you
15 were saying.

16 Q Well, I'm just trying to understand the
17 difference so we can have a discussion about the
18 difference between multiple access and duplex. You
19 just gave me a definition of one type of duplexing.

20 So maybe you can explain the difference
21 between multiple access and duplexing as would be
22 understood by a person of ordinary skill in the art.

1 A Yes. I believe it's best to use the
2 extrinsic evidence if available, so I'll refer to
3 Rappaport.

4 Rappaport opens chapter 8 by saying,
5 "Multiple access schemes are used to allow many
6 mobile users to share simultaneously a finite amount
7 of radio spectrum." I mean, I would say more than
8 one rather than many, but we get the point.

9 So that's multiple access. Multiple
10 access is used to allow a plurality of mobile users
11 to share simultaneously a finite amount of radio
12 spectrum. And then duplex is the way to provide
13 both a forward and a reverse link by partitioning
14 time.

15 Q Well, just to be clear, you said duplexing
16 is a forward and reverse link based on time. But
17 isn't duplexing potentially frequency based as well?

18 A Rappaport -- I'm reading it right from
19 Rappaport. "Time division duplexing uses time
20 instead of frequency to provide both a forward and
21 reverse link." I've -- duplexing has always meant
22 time to me. If -- if you're using two frequency --

1 -- if you're using different frequencies, then
2 that's not time division, that's frequency division.

3 Q All right. Just hold on there. I think
4 you're a little bit confused and let me try and help
5 you out.

6 You understand that there is TDD and FDD,
7 correct?

8 A Yes, and Rappaport defines them right
9 here --

10 Q And both are duplexing, correct?

11 A Yes, they are the -- those are the only
12 two forms of duplexing that come to mind right now.
13 Those are certainly the two overwhelmingly most
14 common and the only two that Rappaport describes
15 here.

16 Q And I asked you for a meaning of duplexing
17 and you defined duplexing as dividing on time. Do
18 you think you might be wrong?

19 MS. SPIRES: Object to form.

20 A Okay. Yes, frequency division duplex is
21 providing two distinct bands of frequencies for
22 every user. Time division duplexing is using time

1 instead of frequency to provide both a forward and
2 reverse link.

3 Q All right. So duplexing as defined
4 doesn't necessarily require time, correct?

5 A Duplexing -- yeah, duplexing is the scheme
6 for providing bidirectional communication.

7 Q And by "bidirectional," we're discussing
8 uplink versus downlink?

9 A For cellular systems, yes.

10 Q If you can look on page 38 -- excuse me --
11 paragraph 38 of your declaration. The last sentence
12 there says that there are two main approaches to
13 managing bidirectional communications, correct?

14 A You said paragraph 28, right?

15 Q 38.

16 A It took me a while to even get to my
17 declaration. So let me read it.

18 Could you restate your question? I've
19 read that paragraph now.

20 Q The last sentence of that paragraph states
21 that there are two main approaches to managing
22 bidirectional communications, correct?

1 A Yes, that's what I mentioned earlier.

2 Q And those two main approaches are FDD and
3 TDD, correct?

4 A Yes, that's correct.

5 Q And why are those the two main approaches?

6 MS. SPIRES: Object to form.

7 A There are different ways that I can answer
8 that question. But I think the simplest that a
9 person of skill would think is that they -- they
10 work from an engineering standpoint.

11 Q And that's why they're the main approaches
12 used?

13 MS. SPIRES: Object to form.

14 A Well, at the time -- okay. Your question
15 is why are they the two main approaches?

16 Q Yeah.

17 A I would want -- I would want to study
18 that -- I would want to study a lot of things before
19 I gave you a complete answer, especially about how
20 technology has evolved over time.

21 But certainly at the time of the patents,
22 and given the technology available, those were the

1 two schemes that were implementable and worked for
2 these kinds of networks.

3 Q Were there other approaches known?

4 MS. SPIRES: Object to form.

5 A Yeah, it's -- there were approaches that
6 were hypothetically known.

7 Q And what would an example be?

8 A I am not speaking from the point of a POSA
9 here. I think that a POSA working on cellular
10 systems at the time of the patent may have only been
11 primarily familiar with the FDD and TDD.

12 But in hindsight as an expert, and someone
13 who was doing research at the time, certainly let's
14 see if -- you could use -- you could use code
15 division -- let's see. Could you -- could you,
16 yeah, I would have to think about it.

17 I believe that, as I sit here right now,
18 I'm not going to emphatically state that FDD and TDD
19 were the only approaches that were hypothetically
20 possible. But I would -- I would need to do more
21 analysis and research to determine, you know, other
22 possible methods, such as code division and how they

1 would be used for duplexing, et cetera.

2 I think that this statement -- this
3 statement stands as valid from the point of a POSA.
4 There are two main approaches to manage
5 bidirectional communications in cellular wireless
6 networks, FDD and TDD.

7 Q Okay. Can you look at paragraph 44 of
8 your declaration.

9 A Yes.

10 Q And it says with respect to TDMA, that
11 such systems would use either FDD or TDD, correct?

12 A Yes, that's what it says.

13 Q And that's because -- well, let me ask
14 this in a few steps.

15 TDMA deals with the way communications are
16 handled among different devices, correct?

17 MS. SPIRES: Object to form.

18 A The statement I can make is that TDMA is a
19 scheme that enables multiple access. I would rather
20 not get into a broader or fuzzier interpretations or
21 definitions.

22 So to your answer, as stated, I don't want

1 to answer yes or no without thinking of every word
2 of the question and analyzing it.

3 But I can say that time division multiple
4 access is a scheme that enables multiple access.

5 Q Multiple access for what? Specifically
6 what are there multiple of?

7 A Well, we talked about that earlier when we
8 were reading that definition from Rappaport, and
9 it's user, mobile device -- from -- with respect
10 to -- with respect to this matter, it can say
11 multiple access for the wireless access devices that
12 you first started asking about in claim 1.

13 Q And then the idea that TDMA can be either
14 FDD or TDD goes to the specific method in which the
15 uplink and downlink traffic is handled, correct?

16 A Uplink and downlink traffic are what?

17 Q Handled.

18 A Could you repeat your question?

19 Q Well, it's not a trick question. I'm just
20 trying to understand whether the selection of FDD
21 and TDD just has to do with how uplink and downlink
22 traffic is divided.

1 MS. SPIRES: Object to form.

2 A I think when you -- when you asked it
3 first you said "handled." "Handled" is probably a
4 better word than "divided."

5 Yeah, I would say that FDD versus TDD is
6 focused on how to provide both an uplink and a
7 downlink to users and from users.

8 Q And FDD assigns different frequencies to
9 uplink and downlink, whereas TDD assigns different
10 time slots, correct?

11 A That's generally correct. I'll refer to
12 the '931 patent for the specific definition of TDD.
13 "A single channel is used for transmission and
14 reception and specific periods of time (i.e., slots)
15 are allocated for transmission and other specific
16 periods of time are allocated for reception."

17 Q Well, that doesn't distinguish it from
18 FDD, though. So is there anything with respect to
19 my characterization of FDD that you disagree with?

20 A I agree with your characterization of FDD.

21 Q Could a system use combinations of FDD and
22 TDD?

1 A To the best of my knowledge, they are
2 mutually exclusive. And I believe that in all of
3 the references in this matter they are mutually
4 exclusive.

5 Q And why do you believe they're mutually
6 exclusive?

7 A Well, I think the best answer is to read
8 again from Rappaport at page 4 of 13, native page
9 395, "Time division duplexing uses time instead of
10 frequency to provide both a forward and a reverse
11 link." So it doesn't say time possibly instead of,
12 or time maybe alone, or maybe along with frequency.
13 It says time instead of frequency, and that is what
14 I understand.

15 I mean, I first started developing
16 communication systems professionally in 1988. Kind
17 of scary.

18 But that's my understanding, and that's
19 what Rappaport -- that's what Rappaport states.

20 Q Can you look at paragraph 41 of your
21 declaration. And in the last paragraph -- excuse
22 me, the last sentence of paragraph 41 there's a

1 discussion of dynamically shifting bandwidth.

2 Do you see that?

3 A Yes, I am reading it.

4 Q And what do you mean by dynamically
5 shifting in the context of TDD?

6 A I think that sentence by itself answers
7 your question. In some TDD systems it is possible
8 or hypothetically possible by design to allocate
9 larger or more time slots to downlink or uplink
10 transmissions. And dynamically would mean the
11 system is somehow reconfigurable to do that.

12 In other words, once you -- once you --
13 you could deploy a TDD -- an engineer could design
14 and deploy a TDD system to the world that is not
15 dynamic -- not dynamically capable, in which case it
16 would never be able to change its uplink versus
17 downlink capacity.

18 But if an engineer wanted to design more
19 complexity into the system in order to have more
20 features, then that engineer could design some
21 feature whereby the system was reconfigurable
22 somehow, and even that leaves lots of open design

1 choices. But it means, as it says, in some kind of
2 reconfigurable way you can change the uplink versus
3 downlink capacity.

4 Q Just to be clear, when we're talking about
5 dynamically shifting in the context of TDD, the
6 bandwidth you're referring to is the number of slots
7 allocated to uplink versus downlink, correct?

8 A Yeah, bandwidth is -- let me see. Yeah,
9 capacity is a better -- capacity is a better word or
10 bandwidth versus time. That's what that really
11 means. Because bandwidth at an instance -- because
12 bandwidth at a given instance in time could be
13 allocated to one or the other. So bandwidth is an
14 okay word. It's just with the clarification that it
15 means, you know, bandwidth provided at a given
16 instance of time or, you know, during a given slot.

17 Q I'm not following. You say bandwidth can
18 be dynamically shifted. I was assuming that
19 bandwidth there was talking about the capacity with
20 respect to time slots. Are you saying something
21 different?

22 A No, that's -- that is a -- that is a

1 good -- that's a fine interpretation.

2 Q Okay. And you state that TDD is more
3 efficient for this dynamic shifting. Why is that?
4 Why is it better than FDD?

5 A I'm reviewing the '931 patent to see what
6 it has to say before I combine that with the answer
7 I have in my head.

8 Let me -- okay. We cite 14 at 10 to 14.
9 I'm reading column 14 of the '931 patent.

10 Q You seem to be reading a lot. Do you need
11 me to repeat the question, or are you looking for
12 something specific?

13 A I am done. I read column 14 through line
14 22, and then I went back and reread it starting at
15 column 13, line 66. So, yes, I am ready to answer
16 your question. But could you restate it so that I
17 have every word?

18 Q Sure. Why is TDD more efficient for
19 dynamic shifting than FDD?

20 A The '931 does not state that, so I will
21 answer as a POSA.

22 The thought behind that statement is that,

1 at least at the time of patent, it was not easy to
2 change the dynamic -- it was not easy to dynamically
3 change the bandwidth. If a system used 5 megahertz
4 channels, or 10 megahertz channels, or 30 megahertz
5 channels, then that's what it used, and it did not
6 attempt to dynamically change the frequency.

7 So it was much easier, if not, you know,
8 the difference between possible or not, to
9 dynamically change the time allocation in order to
10 have more efficient asymmetric bidirectional
11 communications.

12 Q And just so I make sure I understand this,
13 TDD is easier because the system can reallocate time
14 slots however it sees fit, correct?

15 MS. SPIRES: Object to form.

16 A Yeah, I wouldn't say yes to that. There
17 are -- everything is a system design and complexity
18 trade-off.

19 But at the time of these patents, dynamic
20 reallocation of uplink and downlink at the time --
21 at the time of the patent was not a -- it was
22 innovative. It was not a trivial solution. It

1 required engineering, as all these systems always
2 do.

3 Everything -- every device we have in this
4 world requires a huge amount of time and effort.
5 Every electronic device -- every complicated
6 electronic device we have in this world requires a
7 huge amount of labor to design, but I'm not going to
8 go off on a soapbox about that.

9 At the time of this patent, it was deemed
10 more advantageous to design a system to dynamically
11 allocate time slots rather than try to allocate a
12 system to dynamically adjust frequency for a variety
13 of reasons.

14 Q And you mentioned that once a system is
15 set to use 5 megahertz or 30 megahertz, it was
16 difficult to change that. Now, is that an issue
17 that would require retuning a radio, for instance?

18 A I -- there are too many -- there are too
19 many dimensions, variables, factors, so I don't want
20 to get into hypothetical design trade-offs of a
21 system back then.

22 There's also an issue of spectrum and

1 licensing. So I wouldn't -- I wouldn't want to
2 answer any design questions without a very specific
3 system that we were hypothetically designing.

4 Q Well, you said it could be a difference
5 between possible or not. What would make it
6 potentially not possible to reallocate frequency
7 band dynamically?

8 A Well, first off, we're not talking about
9 reallocating -- what do you mean by reallocate
10 frequency band?

11 Q So, as I understand FDD, it uses different
12 frequencies for uplink and downlink, correct?

13 A Yes.

14 Q So --

15 A Yeah, FDD uses different frequencies for
16 different -- for uplink and downlink.

17 Q And so for dynamic allocation in that type
18 of system, you would have to reallocate the
19 frequencies used for uplink relative to the
20 frequencies used for downlink, correct?

21 A No. You and I were thinking two different
22 things, which goes to my point. There's so many

1 different design choices and we better not -- yeah,
2 I don't want to answer any hypotheticals.

3 I was thinking -- let's look at Rappaport,
4 let's look at Rappaport on page 5 out of 13, which
5 is native 396. Are you at Exhibit 2022?

6 Q Yes.

7 A Keep in mind, everything we're talking
8 about here is hypothetical. None of this -- I'm not
9 stating that any of this is -- is or is not related
10 to an opinion I make in my declaration. We're just
11 talking communication theory in the late '90s.

12 But what I meant was -- do you see the
13 diagram that says "Frequency split"?

14 Q Yes.

15 A Okay. Do you see how the bandwidth of the
16 reverse channel -- the box that says "Reverse
17 Channel" is just as wide as the bandwidth that says
18 "Forward Channel"?

19 Q Yeah.

20 A Okay. What I was talking about dynamic
21 reallocation of frequency was making one of those
22 boxes wider or narrower relative to the other

1 dynamically.

2 Q And that's referring to --

3 A That would be one design choice. But I
4 was saying that was less -- that was considered less
5 practical for a variety of reasons.

6 Q And my question is why was that less
7 practical? You mentioned that it might not be
8 possible and that reassigning frequencies was
9 difficult. I just want to know why.

10 A I think it -- I'll retract that. I think
11 it was possible, but I would need to do more
12 analysis than I have time for at this deposition
13 today to answer definitively.

14 But one key point is that that frequency
15 spectrum is paid for, right. People pay a lot of
16 money for the right to transmit within a given
17 frequency band, and the wider that box is, the more
18 the provider pays. So frequency is also something
19 that ideally is not wasted dynamically.

20 So that's why the '931 patent says what it
21 says. I can read all of column 14 for the record,
22 if you want. But that's my answer. My real answer

1 is -- my real answer is column 14 from -- well,
2 actually, it's column 13, line 66, to column 14,
3 line 22, that gives a complete answer.

4 Q As to why a person of ordinary skill in
5 the art would understand that TDD was better suited
6 for dynamic allocation than FDD?

7 A Yes, especially at the time of the patent.

8 Q And when we're talking about dynamic
9 allocation, we're talking about an asymmetry, we're
10 talking about changing the uplink relative to the
11 downlink, correct?

12 MS. SPIRES: Object to form.

13 A I'll refer to the '931 column 14 where it
14 says the advantage of TDD operation is the ability
15 to dynamically allocate the portions of a frame
16 between the uplink and the downlink, that's -- that
17 refers to capacity.

18 Q All right. I want to take a look at your
19 declaration at paragraph 152, please.

20 MS. SPIRES: Justin, whenever you get a
21 second, I think we have been going over an hour.

22 MR. OLIVER: Okay. Let me just finish

1 this one thought and we'll take a break.

2 A You said my declaration at 152?

3 Q Yeah, paragraph 152. On the top of page
4 78, within paragraph 152, there's a sentence before
5 the quote that reads "TDD networks, by contrast, are
6 generally superior for asymmetrical data
7 transmission," and you cite to that section of
8 column 14 that you have been referring me to,
9 correct?

10 A Let me read my paragraph 152.

11 Okay. What is your question?

12 Q So right before the quote of column 14 of
13 the '931 patent, you state, "TDD networks, by
14 contrast, are generally superior for asymmetrical
15 data transmission," correct?

16 A Yes.

17 Q So that discussion of dynamically
18 allocating portions of a frame between the uplink
19 and downlink has to do with the asymmetrical data
20 transmission, correct?

21 A It has to do with data transmission.

22 Symmetric data transmission could affect it, too.

1 Q I guess my point is what makes something
2 asymmetric is you might dynamically allocate more to
3 the downlink than the uplink or vice versa, correct?

4 MS. SPIRES: Object to form.

5 A In that case your capacity allocation
6 would be asymmetric.

7 Q And is that somehow different than the
8 asymmetric data transmission?

9 A I want to make sure I understand every
10 term in your question correctly and if we're talking
11 about what causes what.

12 The need -- is it -- is it the asymmetric
13 data need because the use case is asymmetric, or an
14 asymmetric capacity in your system. So could you
15 ask your question again? I want to listen to every
16 word.

17 Q Well, I'm just trying to make sure I
18 understand your words. You chose to use
19 asymmetrical in paragraph 152, and it seems to be in
20 connection with a statement that TDD networks are
21 superior for asymmetrical data transmission,
22 correct?

1 A Yes.

2 Q And then the quote that follows is about
3 the dynamic allocation of portions of the frame to
4 the uplink and downlink, correct?

5 A Yes.

6 Q So I am asking you is what's discussed in
7 that block quote an example of asymmetrical data
8 transmission, since you've used that terminology?

9 A I don't agree with the question as stated.
10 Let me have the question again. Maybe I can help us
11 move forward.

12 Q Why don't you just explain to me what
13 you're referring to as asymmetrical in paragraph
14 152.

15 A Asymmetric typically means that the
16 downlink data need or capacity is different than the
17 uplink data need or capacity, whereas symmetric
18 would indicate that they are equal or virtually
19 equal.

20 Q So if the system was asymmetric, that
21 would indicate that there are more time slots
22 allocated to, for example, downlink as compared to

1 uplink, correct?

2 A I would flip that around. I would say if
3 there were -- if there was more capacity allocated
4 to uplink than downlink, then that capacity
5 allocation is asymmetric.

6 MR. OLIVER: Okay. Why don't we take a
7 break.

8 MS. SPIRES: About how long?

9 MR. OLIVER: How long would you like?
10 Five minutes? Ten minutes?

11 MS. SPIRES: I'm good with whatever.

12 MR. OLIVER: Off the record.

13 (Recess 12:14 p.m. - 12:25 p.m.)

14 BY MR. OLIVER:

15 Q Dr. Chrissan, can you open up, if you
16 still don't have it open, Exhibit 1021?

17 A Newton's.

18 Q Yes.

19 A I have it.

20 Q Turn to page 876, which is page 9 of the
21 PDF.

22 A Yes.

1 Q And on the left-hand column there's a
2 definition for TDD, correct?

3 A Yes.

4 Q And for the first part of that, the last
5 sentence says, "TDD is flexible with regard to
6 allocation of time slots for forward and reverse,
7 making it best suited for asymmetrical applications
8 such as web browsing."

9 Do you see that?

10 A Yes, I see that.

11 Q Is that the same principle that you were
12 discussing in paragraph 152 of your declaration that
13 we were just discussing before the break?

14 A Yes, it's the same general concept.

15 Q If you could turn to paragraph 48 of your
16 declaration.

17 A I'm there.

18 Q And in paragraph 48 you talk about timing
19 of the downlink and uplink being a key aspect. Is
20 that correct?

21 A It says, "a key aspect of the present
22 invention is that the timing of the downlink and

1 uplink positions of each TDD frame must be precisely
2 aligned."

3 Q Okay. And why is that a key aspect?

4 MS. SPIRES: Object to form.

5 A There are different ways to answer that
6 depending on the system. So let's review what the
7 '931 patent says. I'm going to go to column 16, 4
8 to 8 first, but I think I'll have to look elsewhere
9 within the patent. I know it talks about it, it
10 talks about -- it talks about the design
11 complexities that must be considered in a TDD system
12 when switching between uplink and downlink.

13 Let me take a look for some things.

14 Let me hear your question again, though.
15 I want to make sure I don't waste time looking for
16 the wrong thing.

17 Q I'm just asking why the timing is a key
18 aspect.

19 A Okay. I searched for a few terms and
20 found what I was looking for. If you look at Figure
21 3, there is a -- if you look at Figure 3 of the '931
22 patent, the bottom row -- the bottom figure of the

1 three figures in Figure 3, you'll see -- in the
2 middle you'll see a block 350, which is a gap, or a
3 space between uplink and downlink.

4 So then if you search for 350, it will
5 take you to column 15 of the '931 patent at line 61.
6 So I'll read that. "TDD transition period. The TDD
7 transition period 350 separates the uplink portion
8 and the downlink portion and allows for transmitter
9 to receiver propagation delays for the maximum range
10 of the cell link and for delay associated with
11 switching hardware operations from TX to RX or from
12 RX to TX. The position of TDD transition period 350
13 may be adjusted, thereby modifying the relative
14 sizes of the uplink portion and the downlink portion
15 to accommodate the asymmetry between data traffic in
16 the uplink and the downlink."

17 That's one -- I think that's a good
18 example, an explanation of why the timing is
19 important to engineer properly.

20 Q Okay. Can you look at the '931 patent
21 column 33, claim 28.

22 A Yes.

1 Q Does claim 28 have any requirement for the
2 timing of the uplink relative to the downlink?

3 MS. SPIRES: Object to form.

4 A Yeah, this -- give me some time here
5 because claim 28 is claim 1 as well.

6 Okay. I've read claim 1 and claim 28.
7 Could you repeat your question?

8 Q Was there anything in claim 1 or 28 that
9 required specific timing of the uplink relative to
10 the downlink?

11 MS. SPIRES: Object to form.

12 A Well, one thing that stands out is TDD,
13 that certainly influences the timing of the uplink
14 relative to the downlink. To answer your question
15 completely, I would need to go off and do a separate
16 analysis. But I think I answered your question at
17 least at a high level.

18 Q So what about if we're citing TDD would
19 indicate to you timing of uplink and downlink?

20 A I think we've already discussed that. Let
21 me go back to Rappaport where it says "Time division
22 duplexing (TDD) uses time instead of frequency to

1 provide both a forward and reverse link." So
2 starting from that, we can analyze whatever you want
3 from there, but there's at least some aspect of
4 time.

5 Again, I would need to do an analysis and
6 come up with an opinion that I haven't formulated to
7 answer anything in more detail.

8 Q Can you look at paragraph 54 of your
9 declaration, please.

10 A Yeah. Let me get there. Okay.

11 Q And the last sentence of paragraph 54
12 states that "a beamforming network can create two or
13 more independent beams with low self-interference
14 that allow simultaneous communications using the
15 same frequency," correct?

16 A My declaration does state that as a quote
17 from the patent. So let me look at the '931 at
18 column 25, 63 and its surrounding text.

19 Okay. Yeah, that's a statement from the
20 patent.

21 Q And how does a beamforming network allow
22 for simultaneous communications?

1 A One answer is to use space division
2 multiple access, which is defined in the '931 patent
3 itself at column 5, and I'm reasonably sure I use
4 this definition in my declaration as well. "In an
5 SDMA system, subscribers share a frequency but one
6 or more physical channels are formed using antenna
7 beamforming techniques."

8 So certain antennas, such as an array
9 element -- an array antenna designed properly with
10 dynamically driven elements, can implement space
11 division multiple access, which gives the benefit
12 that was described in the patent and reproduced in
13 my declaration.

14 Q And that benefit is simultaneous
15 transmission?

16 A Yes, that's the benefit described here,
17 simultaneous multiple access to spacially
18 independent users.

19 Q And so SDMA provides that simultaneous
20 access, correct?

21 MS. SPIRES: Object to form.

22 A Yes. See the statement -- the statement

1 from the patent stands on its own. Advanced
2 beamforming techniques provide simultaneous multiple
3 access to spacially independent users. But that is
4 generally what is referred to as one form of SDMA.

5 Q Can you turn to paragraph 61 of your
6 declaration.

7 A Yes. I'm there.

8 Q And in paragraph 61, in the first section
9 before the block quote, you refer to a benefit of
10 the invention being simultaneous beams. Is that
11 correct?

12 A Well, the benefit is two to four times the
13 amount of spacial reuse.

14 Q Well, why don't you take a look at the
15 first sentence after the block quote, which states,
16 "These passages and others make it clear that the
17 ability to allow multiple downlink data
18 transmissions at the same time is one of the key
19 benefits of the '931 patent," correct?

20 A Yes, I state that.

21 Q Okay. And why is that a key benefit?

22 A The short answer is increased capacity for

1 a given amount of license to spectrum. But the
2 statement also reads for itself the benefit is the
3 ability to allow multiple downlink data
4 transmissions at the same time.

5 Q And sticking to paragraph 61, a few more
6 lines down -- actually, the next sentence says that
7 a person of skill would understand that the language
8 of claim 28 and of claim 29 embraces situations
9 where multiple downlink transmissions occur at
10 precisely the same time, correct?

11 A Yes.

12 Q And then it goes on to state that they
13 would not necessarily be limited to different slots
14 within a larger downlink portion of the claimed TDD
15 frame, correct?

16 A Yes.

17 Q So that seems to suggest that you believe
18 that simultaneous transmission is an option for the
19 claims, but that the claims aren't necessarily
20 limited to simultaneous transmission. Am I
21 understanding that correctly?

22 A Could you repeat your question?

1 Q Well, why don't you just explain to me
2 what you mean by the phrase "they would not
3 necessarily be limited to different slots within the
4 larger downlink portion of the claimed TDD frame."

5 A I think that statement stands on its own.
6 The language of -- the bounds of claim 28 include
7 situations where multiple -- multiple downlink
8 transmissions are simultaneous and they -- the scope
9 of the claim includes the case that of different
10 slots within the downlink portion of the TDD frame.
11 I didn't -- I didn't see anything in the claim that
12 limited it one way or the other.

13 Q Your last statement was that the claims
14 include the case that different slots within the
15 downlink portion of the TDD frame. I don't think
16 you finished your thought --

17 A Well, the statement -- sorry, I
18 interrupted you. My statement says they would not
19 necessarily be limited to different slots within a
20 larger downlink portion of the claimed TDD frame.

21 So, to clarify, that means that different
22 slots within a larger downlink portion of the

1 claimed TDD frame is still within the scope.

2 Q The next sentence states that a person of
3 skill would be discouraged from following the path
4 set out in any prior art reference that precludes
5 the ability to perform multiple downlink
6 transmissions in the same time slot, correct?

7 A Yes, that's what it says.

8 Q And why would a person of ordinary skill
9 be discouraged from following something that
10 precludes simultaneous transmissions?

11 MS. SPIRES: Object to form.

12 A I'm reviewing the '931 patent.

13 Q Well, just to be clear, I'm asking what a
14 person of ordinary skill in the art would have been
15 discouraged from, so that person would not have the
16 '931 patent in front of them, so keep that in mind
17 in the context of my question.

18 A I don't understand your question. I think
19 it may get into legal principles. Could you --
20 given that you framed it as unrelated to the '931
21 patent, so could you inform me about your specific
22 question and -- and some background?

1 Q Sure. You're referring to a person of
2 ordinary skill in the art being discouraged from
3 combining different prior art references that
4 preclude performing multiple downlink transmissions.
5 So the person of ordinary skill in the art combining
6 references is just looking at the references. They
7 don't know the content of the '931 patent.

8 So with that understanding, what -- what
9 would preclude or discourage a person of ordinary
10 skill in the art from combining references that
11 don't allow for simultaneous transmission?

12 MS. SPIRES: Object to form.

13 A I must honestly state I don't understand
14 your question within the framework that you're
15 asking it.

16 Q Well, I'll state it just simply. You
17 state that a person of ordinary skill in the art
18 would be discouraged from following the path set out
19 by a prior art reference that precludes the ability
20 to perform multiple downlink transmissions, correct?

21 MS. SPIRES: Object to form.

22 A That's what I state.

1 Q So I'm asking why would the person of
2 ordinary skill in the art have been discouraged from
3 doing so? And if your answer is based on what the
4 '931 patent says, just explain that to me. But I
5 just want to know why you said the person of
6 ordinary skill in the art would be discouraged.

7 A Well, I can't say that either. Let me
8 take some time to review some materials, including
9 the legal principle section of my declaration. This
10 may take a while.

11 Q You remember writing that sentence,
12 correct?

13 A Yes.

14 Q When you wrote it, what did you mean?

15 MS. SPIRES: Object to form.

16 Q Dr. Chrissan, just to be clear, the last
17 question I have doesn't require to look at anything
18 else. I'm just wondering if you know what you
19 meant. If you need to refer to something else, let
20 me know and we can determine whether that's needed.

21 A As I mentioned, I wanted to -- I want to
22 review the legal principles portion of my

1 declaration.

2 Q You know what, I'll withdraw that
3 question. We can come back to it later, if
4 necessary.

5 Can you turn to paragraph 66 of your
6 declaration.

7 A I'm still on your last question. I'll
8 move on after a minute.

9 Q Well, I've withdrawn the question, so why
10 don't we just move on. We can come back to it
11 later, if need be.

12 Are you looking at paragraph 66?

13 A I'm getting there. Okay. I'm at
14 paragraph 66.

15 Q The last sentence of that paragraph
16 states, "Although I discuss simultaneity as a goal
17 of Vornefeld and not Atsuta with respect to a person
18 of skill's lack of motivation to combine these
19 references, I do not address a construction limiting
20 the challenged claims to the simultaneous
21 transmission of signals" --

22 (Court Reporter clarification.)

1 Q "Although I discuss simultaneity as a goal
2 of Vornefeld and not Atsuta with respect to a person
3 of skill's lack of motivation to combine the two
4 references, I do not address a construction limiting
5 the challenged claims to the simultaneous
6 transmission of signals."

7 Do you see that?

8 A Yes.

9 Q And that's sort of what we just discussed
10 is you believe that the claims could cover
11 simultaneous transmissions as well as transmissions
12 separated in time, correct?

13 A Transmissions that are not simultaneous,
14 yes.

15 Q TDMA would be an example of a method in
16 which transmissions to different subscribers would
17 be separated on the time axis, correct?

18 A When you say TDMA, do you mean -- you're
19 referring to the TDMA that we discussed as in
20 Rappaport?

21 Q Yes.

22 A According to Rappaport, yes.

1 Q Can you turn to paragraph 68 of your
2 declaration.

3 A Yes.

4 Q In paragraph 68 the second sentence from
5 the ends states, "As such, any prior art reference
6 that precludes the ability to perform simultaneous
7 transmission teaches away from claims 28 and 29."

8 Do you see that?

9 A Yes.

10 Q What would cause a reference to preclude
11 simultaneous transmission?

12 MS. SPIRES: Object to form.

13 A One way is -- there are multiple ways to
14 answer the question, but I think the best is simply
15 as stated, precludes the ability to perform
16 simultaneous transmission means teaches that
17 simultaneous transmission does not happen.

18 Q Okay. So when you say teaches that
19 simultaneous transmission does not happen, can you
20 clarify that?

21 And specifically what I'm asking is if a
22 reference just doesn't describe simultaneous

1 transmission, versus it says you can't do
2 simultaneous transmission, are you looking at one or
3 the other or both of those options as being
4 precluding?

5 MS. SPIRES: Object to form.

6 A If a preclude from the -- preclude from a
7 standpoint of a person of skill would mean --
8 regarding a communication system would mean, you
9 know, I have reviewed the system and it does not
10 perform simultaneous transmission, and it would have
11 to be -- the system would have to be changed or
12 redesigned if I wanted to enable it to perform
13 simultaneous transmission.

14 Q And when we're talking about simultaneous
15 transmission, we're talking about simultaneous
16 transmissions to different access devices, correct?

17 A I would say to or from, but it refers
18 to -- it generally refers to one direction. Let me
19 double-check that.

20 Let me read this --

21 Q Let me rephrase it to simultaneous
22 transmission with different access devices,

1 regardless of whether it's to or from.

2 A I'm reading paragraph 68 from the start.

3 So the context of this is downlink. I say
4 that simply to note that for the record.

5 So then, yes, could you repeat your
6 question?

7 Q So the simultaneous that we're talking
8 about is about, for instance, downlink to different
9 devices at the same time, correct?

10 A I would agree with that.

11 Q And sticking with paragraph 68 still, you
12 refer to the term "teaches away." What's your
13 understanding of what "teaches away" means?

14 MS. SPIRES: Object to form.

15 A I will refer to the legal principle
16 section of my declaration at paragraph 33. "Counsel
17 has informed me, and I understand, that a reference
18 may be said to teach away when a person of ordinary
19 skill, upon reading the reference, would be
20 discouraged from following the path set out in the
21 reference, or would be led in a direction divergent
22 from the path that was taken by the applicant of the

1 '931 patent." That's my answer.

2 Q Okay. Can you turn to paragraph 62 of
3 your declaration. And at paragraph 62 you set forth
4 particular claim constructions from the District
5 Court case, correct?

6 A Yes.

7 Q And at the end of that paragraph you state
8 that you use those constructions in your analysis,
9 correct?

10 A Yes, I do.

11 Q And with respect to the construction of
12 sector or sectors, do you agree with the District
13 Court's construction?

14 A I have no reason to disagree with it.
15 Therefore, I accept it as the construction of
16 sector.

17 Q Okay. Can you turn to claim 28 of the
18 '931 patent on column 33.

19 A Yes.

20 Q And that refers to a downlink portion of a
21 TDD frame, correct?

22 A Yes.

1 Q And what's your understanding of what a
2 downlink portion of a TDD frame is?

3 MS. SPIRES: Object to form.

4 A That is described in the '931 patent. Let
5 me find the place. For example, column 14 at line
6 45 says, "Exemplary TDD frame 321 is illustrated in
7 greater detail. TDD frame 321 comprises a downlink
8 portion (i.e., base station to subscriber
9 transmission) and an uplink portion (i.e.,
10 subscriber to base station transmission)."

11 So we can go to I guess that's Figure 3,
12 321. Okay. Yeah, Figure 3 is a good -- is a good
13 depiction.

14 Q Okay. So a TDD frame has a downlink
15 portion, which is shown on the left in Figure 3, and
16 it has an uplink portion, which is shown on the
17 right in Figure 3, correct?

18 A At least within the exemplary embodiment
19 of Figure 3.

20 Q And the individual slots are for different
21 downlink transmissions, correct?

22 A The slots 341, 342 and 343 are downlink

1 slots. How they are used specifically we would have
2 to get into a particular analysis or use case. But
3 certainly 341, 342 and 343 as depicted are downlink
4 slots.

5 Q And would they potentially be assigned to
6 different access devices?

7 MS. SPIRES: Object to form.

8 A Those slots are described at column 14,
9 line 60, it's a good description. The downlink slot
10 -- "The D downlink slots, including exemplary
11 downlink slots 341 to 343, contain transceiver base
12 station-to-subscriber" -- "subscriber transmissions
13 of user traffic and/or control signals."

14 Q So does that mean that those different
15 slots are assigned to different subscribers?

16 A I believe within the scope of the '931
17 patent that is a possible usage.

18 Q If you could take a look at the Vornefeld
19 reference, please.

20 A Yes.

21 Q And specifically Figure 3.

22 A Let me get there. Yes, I see Figure 3.

1 Q And the Figure 3 has a downlink phase and
2 an uplink phase, correct?

3 A It does show that.

4 Q So that would indicate a TDD style frame,
5 correct?

6 A Could you clarify what you mean by a TDD
7 style frame?

8 Q A TDD structure, meaning there is a
9 downlink phase and an uplink phase separated on the
10 time axis.

11 A I'm reviewing Vornefeld. I'm taking a
12 couple minutes to review Vornefeld in its entirety
13 in context. It's not very long.

14 Q Have you not already considered this?

15 A I have reviewed Vornefeld many times, and
16 the things that I considered are in my declaration.
17 So we'll -- we will refer to Vornefeld in my
18 declaration. But I do not have a photographic
19 memory, I must admit, so I do need to review
20 Vornefeld.

21 Q Okay. Before you do that, and I'll give
22 you time to do that, if you could turn to, for

1 context, paragraph 75 of your declaration, and there
2 you discuss the prior application of Vornefeld by
3 the Patent Trial and Appeal Board, correct?

4 A Yes.

5 Q And you understand that the Patent Trial
6 and Appeal Board found claim 1 of the '931 patent to
7 be unpatentable in view of Vornefeld, correct?

8 A Could you repeat your question?

9 Q The Board found that claim 1 was
10 unpatentable in view of Vornefeld, correct?

11 A Let's refer to the -- I believe the answer
12 to that is yes. I believe you're referring to the
13 prior 978 IPR, correct?

14 Q Correct.

15 A And I know that the -- I have reviewed
16 some of the PTAB's decisions in that. So let me
17 take a look at them. I don't think it will take
18 long.

19 Q Just so we're clear, though, are you aware
20 that the only claims at issue are 28 and 29?

21 A I am aware that the claims at issue are 28
22 and 29.

1 Q And are you aware that claim 1 has been
2 ruled unpatentable and cancelled from the patent?

3 A As I sit here right now, I believe that's
4 the case. But I did want to take a quick look at
5 the -- at the related exhibit.

6 Q And which exhibit is that, just for the
7 record?

8 A Oh, yeah, that's a good point. Sorry.
9 Yeah, you're right, I don't want to open -- it would
10 be Exhibit 10 -- I think the final written decision
11 and the final written decision on remand were I
12 think 10 maybe 8 and 10, but, yeah, you're right.
13 No, it's 1009, you have it. You have it. You have
14 paper 43, Exhibit 1009 in the exhibits, so can I
15 open that?

16 Q Sure.

17 A I want to review it.

18 Q And if -- I can direct your attention to
19 make it easier. If you look at page 7.

20 A Yeah, you may as well just tell me where
21 it is so I can just read it.

22 Q Page 7 of Exhibit 1009 there's a section

1 heading called "Adverse Judgment." Do you see that?

2 A Right. So it states: For the reasons
3 that follow, we enter adverse judgment against
4 patent owner with respect to independent claims 1,
5 10 and 19 of the '931 patent, and we determine that
6 petitioner has not shown that dependent claims 2 to
7 9, 11 to 18, and 20 to 29 and are unpatentable." It
8 says for the reasons that follow. Let me --

9 Q I'm sorry. I was directing your attention
10 to page 7. What page are you reading from?

11 A Sorry. Let me -- we're at -- so we're on
12 paper 43, Exhibit 1009, right?

13 Q Yes, page 7.

14 A Okay. I just searched for adverse
15 judgment. Okay. Yeah, Section II "Adverse
16 Judgment," "Both in its response and at the oral
17 hearing, patent owner conceded the unpatentability
18 of independent claims 1, 10 and 19. Patent owner
19 does not herein dispute the patentability of the
20 independent claims 1, 10 and 19 of the '931 patent."

21 Okay. So the PTAB was accepting an
22 admission from patent owner in a prior IPR and

1 rendered claims 1 and 19 unpatentable.

2 Q And you can see from that it was based on
3 Vornefeld?

4 A I can imply without looking at the
5 transcript at 56:19 to 57:9, I'll take my best guess
6 and assume that the admission by patent owner or
7 patent owner's expert was, quote, "Vornefeld knocks
8 out our independent claims. We concede that."

9 Q And you're not disputing the applicability
10 of Vornefeld to claim 1, correct?

11 A I am not stating an opinion on that matter
12 in this declaration.

13 Q If you could look at claim 1 of the '931
14 patent.

15 A Yes, I am there.

16 Q And the preamble, as I think you referred
17 to before, refers to a TDD communication, correct?

18 A Yes.

19 Q And if you look down around line 44, there
20 is a reference to a TDD frame.

21 A Yes, there is.

22 Q And just for clarity, if you're not in

1 your declaration disputing what has already been
2 determined with respect to the application of
3 Vornefeld to claim 1, then you're not disputing
4 Vornefeld's disclosure of a TDD frame as described
5 in claim 1. Is that fair? Or am I missing
6 something?

7 A I am not disputing it with respect to that
8 judgment that we discussed earlier regarding IPR --
9 the 978 IPR, that is correct.

10 Q So with that, going back to Vornefeld, do
11 you have any reason to dispute that what's shown in
12 Figure 3 is a TDD frame?

13 A I don't have an answer to that. I don't
14 have that analysis or that connection. I can't
15 immediately make a connection between what an expert
16 conceded in a prior IPR and a particular diagram
17 from a prior art reference.

18 Q Well, let me just ask you a very precise
19 question. Looking at Vornefeld's Figure 3, and
20 seeing that the downlink phase and the uplink phase
21 are separated on a time axis, would that be enough
22 for you to understand that that is a TDD frame?

1 A No. It would be enough to -- for me to
2 understand it as TDD.

3 Q And explain to me the difference between
4 TDD and a TDD frame.

5 A A TDD is a protocol that uses time instead
6 of frequency to provide both a forward and a reverse
7 link. A TDD frame, especially within the light
8 of -- especially in light of the '931 patent, I
9 haven't -- I haven't analyzed it -- I haven't
10 analyzed it or any sort of system in detail beyond
11 what I showed you before how the '931 patent depicts
12 and describes a TDD frame.

13 Q Okay. Looking again at Figure 3 of
14 Vornefeld, at the bottom it states the basic frame
15 structure, do you see that?

16 A Yes, it does depict the -- a basic frame
17 structure.

18 Q So what's depicted is a frame?

19 A What's depicted is a frame structure.
20 Exactly how it partitions or denotes frames is not
21 indicated in Figure 3. In fact, I think the PTAB in
22 the Federal Circuit have a statement on that. But I

1 haven't done the analysis. I simply accepted their
2 ruling and found no reason to dispute it.

3 Q Okay. Going back to claim 28 of the '931
4 patent, claim 28 refers to transmissions to
5 different wireless access devices, correct?

6 A I'm reading claim 28. You said 28, right?

7 Q Correct.

8 A A transceiver as -- I'm reading claim 28
9 out loud somewhat to myself. "The transceiver as
10 set forth in claim 1 wherein said transmit path
11 circuitry transmits, in said downlink portion of
12 said TDD frame, second downlink data traffic to
13 substantially only wireless access devices within an
14 other of said sectors using an other of said
15 directed scanning beam signals."

16 Okay. What was your question about claim
17 28?

18 Q So claim 28 recites relative to claim 1
19 the transmissions to different wireless access
20 devices, correct?

21 A I'm going to go back to claim 1 and then
22 I'll ask you to re-ask your question.

1 Okay. What was your question?

2 Q Just that claims 1 and 28 refer to
3 transmissions to different access devices, correct?

4 A They refer to access devices within a
5 sector and then access devices within another
6 sector. To the extent -- or given the Court's
7 construction of sector, to the extent the different
8 access devices are in different sectors, then, yes,
9 it's generally talking or maybe not -- yeah, it's
10 generally talking of devices in different geographic
11 locations.

12 Q And when talking about communications with
13 different access devices, that's a question of the
14 multiple access methodology, correct?

15 MS. SPIRES: Object to form.

16 A We would have to analyze a particular use
17 case for that, because now we're talking about
18 devices in different sectors, whereas before with
19 respect to TDD -- with respect to all of these
20 protocols, TDMA, SDMA, TDD, FDD, we were talking
21 about devices that were not necessarily in different
22 sectors.

1 So if you have a specific question, please
2 frame it within the context of a specific system.

3 Q Well, I'm just trying to understand if
4 there has to be transmissions to different devices,
5 wouldn't that be a question of what multiple access
6 method to use, correct?

7 MS. SPIRES: Object to form.

8 A The answer is system dependent. I restate
9 the same thing that I said. Here we're also talking
10 about devices in different sectors. So there may be
11 different aspects to the multiple access system
12 design.

13 Q Well, it also talks about only wireless
14 devices within another sector. So there's multiple
15 devices potentially within a sector and a cross
16 sector, correct?

17 A Are you giving me the definition of a
18 system that you want me to analyze?

19 Q I'm just trying to -- well, let me --
20 let's take it this way. If we're talking about
21 duplexing such as TDD, those types of methods only
22 address how to deal with uplink and downlink,

1 correct?

2 A Duplex -- yes, we've established this
3 before. TDD and FDD are -- and duplex is generally
4 related to how to handle bidirectional
5 communications.

6 Q Okay. And multiple access methods, such
7 as TDMA, are generally related to how to communicate
8 with different devices. Is that fair?

9 A Providing multiple access.

10 Q And as we discussed already, the multiple
11 access refers to multiple devices that we're talking
12 about, correct?

13 A We have discussed that plurality of
14 devices with respect to multiple access as defined
15 when we went back to that definition in Rappaport.

16 MR. OLIVER: Okay. We've been going for a
17 little over an hour. Why don't we take a break.
18 Why don't we come back at quarter till? Is that
19 fine?

20 THE WITNESS: That's nine minutes. How
21 about 10 till?

22 MR. OLIVER: What time do you have right

1 now?

2 THE WITNESS: I have 34 past the hour. So
3 an 11-minute -- yeah, you're right, yeah, we can do
4 an 11-minute break. We'll come back at quarter
5 till. My apologies.

6 MR. OLIVER: All right.

7 (Recess 1:34 p.m. - 1:44 p.m.)

8 BY MR. OLIVER:

9 Q Dr. Chrissan, can you turn to Vornefeld,
10 please.

11 A Yes.

12 Q And specifically if you could look at the
13 page 53 of that document on the right column.

14 A Yes.

15 Q And at the top of the right column it says
16 it is a joint TDMA-SDMA approach, correct?

17 A Yes, it says it's a TDMA-SDMA approach in
18 the connect of HIPERLAN/2.

19 Q And we've discussed TDMA and SDMA a little
20 already today. They are both multiple access
21 methods, correct?

22 A Yes, they are.

1 Q And for TDMA, communications with
2 different devices are divided on the time axis,
3 correct?

4 A I'm analyzing every word of the question.
5 That is one possible thing that the TDMA -- that a
6 TDMA protocol enables.

7 Q And it's the protocol that's described in
8 Rappaport that we looked at earlier today, correct?

9 A Yeah, Rappaport is copyrighted 1996, and a
10 person of skill in the art in 1996 would have
11 understood TDMA as Rappaport describes it.

12 Q And SDMA indicates that different devices
13 are communicated with based on their spacing from
14 each other. Is that a fair way to put it?

15 A It's best to simply use the definition in
16 the '931 patent. In SDMA, subscribers share a
17 frequency, but one or more physical channels are
18 formed using antenna beamforming techniques. That's
19 SDMA as utilized -- that's SDMA as defined in the
20 '931 patent. And Vornfeld describes SDMA as well.
21 We can use Vornfeld's description of SDMA. I don't
22 think -- I don't think the two are very different

1 from each other.

2 Q And SDMA allows for simultaneous
3 transmissions to different devices, correct?

4 A That is a feature that SDMA enables.

5 Q So a joint TDMA-SDMA approach would allow
6 for transmissions or, rather, communications within
7 different devices both in different time slots and
8 simultaneously if they're in different positions.
9 Is that fair?

10 MS. SPIRES: Object to form.

11 A If they could be -- rather than state
12 different positions, I would say if they can be
13 differentiated in the spacial domain.

14 Q And if they can't be differentiated in the
15 spacial domain, there's still the ability to use the
16 TDMA part of the system to communicate with
17 different devices.

18 A According to Vornefeld's interpretation of
19 TDMA-SDMA, I would agree with that.

20 Q And still looking at the right-hand column
21 of page 53 of Vornefeld, it states that the approach
22 is also supported by some additional characteristics

1 that are listed there with bullet points. Do you
2 see those?

3 A Yes.

4 Q And the second one is TDD.

5 A Is your question simply that Vornefeld
6 states what it states?

7 Q That Vornefeld states that its approach
8 uses TDD, correct?

9 A I think that's a true interpretation of
10 Vornefeld. What it says literally is "we describe
11 and evaluate concepts for a joint TDMA-SDMA approach
12 in the context of HIPERLAN/2, which is supported by
13 the following system characteristics," and one of
14 those system characteristics is TDD.

15 Q So the uplink and downlink is a TDD
16 approach, correct?

17 A Please restate your question.

18 Q It's just that from what we can read there
19 in Vornefeld, the methodology for uplink and
20 downlink transmissions is a TDD approach, correct?

21 A Yes, a TDD approach wherein Vornefeld
22 states the same frequency is used for uplink and

1 downlink.

2 Q And then for the transmissions to
3 different devices, it may be one or more of TDMA and
4 SDMA?

5 A I wouldn't state it that generally. I
6 would say that for multiple access functionality,
7 Vornefeld clearly uses time division multiple access
8 and space division multiple access.

9 Q And in Vornefeld, the SDMA is achieved
10 through beamforming, correct?

11 A I'll read from Vornefeld page 52 right
12 column, "Mainly two types of spacial signal
13 processing algorithms are required to enable SDMA:
14 spacial filtering separates the signals impinging on
15 the antenna array during reception and beamforming
16 algorithms control the radiating directions of the
17 array during transmission."

18 So given that description, I believe that
19 description answers your question.

20 But state the question again and I'll
21 answer it.

22 Q No, that answers the question. That's

1 fine. And just so we're clear, where specifically
2 on the right-hand column of 52 were you reading?

3 A About the middle. Second -- first -- the
4 first true opening paragraph, but it's in the middle
5 of the column.

6 Q All right. And with respect to
7 beamforming, later in that paragraph it refers to a
8 uniform linear array, correct?

9 A In the prior paragraph it refers to
10 uniform --

11 Q I'm sorry. Okay, prior paragraph, yeah.

12 A Yeah.

13 Q And that --

14 A Yes.

15 Q And that array is what's used for
16 beamforming, correct?

17 A A uniform linear array can be used for
18 beamforming as described here by Vornefeld.

19 Q And in that same section it states that
20 the ULA, or the uniform linear array, is restricted
21 to values below 180 degrees, correct?

22 A Vornefeld does state that the ULAs it is

1 describing and using do have a coverage area that's
2 restricted to values below 180 degrees.

3 Q And that same section goes on to state
4 that a triangular configuration of three ULAs might
5 be used to cover the whole radio cell, correct?

6 A Yes, it does say that.

7 Q And in that case, each one of those ULAs
8 would be assigned or define its own sector, correct?

9 A I discuss that in my declaration. Let me
10 find it.

11 My answers to your question are covered in
12 paragraph 71 and 73 of my declaration. Do you want
13 me to read it for the record?

14 Q No. I see from those that you refer to
15 the idea that Vornefeld doesn't use the term
16 "sector," correct?

17 A Again, my complete answer is everything
18 that is written, including in paragraph 73, that's
19 where I say "Because all the elements of each ULA in
20 Vornefeld are used to transmit to users" -- let me
21 restart. Let me restart.

22 Paragraph 73, sentence 3, "Because all the

1 elements of each ULA in Vornefeld are used to
2 transmit to users in the area it covers, the
3 entirety of the area served by one ULA is only one
4 'sector.'"

5 So a person of skill, even though
6 Vornefeld does not use the term "sector," a person
7 of skill may relate the coverage area of a ULA in
8 Vornefeld to a sector.

9 Q So in the example given in Vornefeld of
10 three ULAs, that would mean there are three sectors
11 in that implementation, correct?

12 A Again, given my paragraphs 71, 72 and 73,
13 a person of skill if trying to make the connection
14 would make that correspondence.

15 Q Can you look at paragraph 69 of your
16 declaration, and the second full sentence says, that
17 Vornefeld describes the use of space division
18 multiple access, SDMA, and beamforming within a
19 single sector. Is that correct?

20 A Yes, yes.

21 Q And what do you mean by Vornefeld
22 describing SDMA within a single sector?

1 A Exactly as it states. Let me go back.
2 Vornefeld's entire description including, for
3 example, Figure 2, Figure 3, and all of the
4 discussion related, a person of skill would equate
5 that Vornefeld is describing what is happening in
6 one sector with one ULA.

7 Q So the simultaneous transmissions that you
8 discuss and that Vornefeld discusses with respect to
9 that reference are happening within one sector. Is
10 that fair?

11 A Within the -- yeah, within the scope of
12 Vornefeld's discussion of SDMA, it's my opinion that
13 Vornefeld is only describing the protocol and
14 analysis within one sector for the reasons stated in
15 my declaration in more sections than the ones we
16 just pointed to.

17 Q So for the example we've discussed from
18 Vornefeld where there might be three different ULAs,
19 each communicating with its own sector, would the
20 communications taking place in a different sector
21 have to be simultaneous or at a different time
22 relative to communications taking place in the first

1 sector?

2 A I don't have an opinion on that. I didn't
3 analyze Vornefeld in that regard.

4 Q Okay. So you agree that Vornefeld
5 describes simultaneous transmissions within one
6 sector?

7 A Within the scope of how Vornefeld
8 describes SDMA, yes.

9 Q But you haven't considered how the
10 arrangement of transmissions in the next sector
11 would occur relative to the first sector?

12 MS. SPIRES: Object to form.

13 A Yeah, my -- my opinions are in my
14 declaration. I can pull them up if you want. It's
15 all of my section on Vornefeld.

16 So let me hear your question again.

17 Q I'm just curious about the arrangement of
18 communications to different devices across sectors,
19 would it have to be divided on a time basis, or
20 could it be an SDMA protocol, or would it be up to
21 the designer?

22 MS. SPIRES: Object to form.

1 A So there's -- there's too many ways to
2 interpret your question.

3 All I can say with respect to Vornefeld is
4 Vornefeld describes the operation of one sector.
5 And all of my opinions are in my declaration. I
6 believe I have some comments and opinions on
7 Vornefeld's operation at sector boundaries. We can
8 refer to those if it matters.

9 Q Well, how do you understand Vornefeld to
10 address issues of interference at sector boundaries?

11 A At paragraph 74 I state, "Vornefeld does
12 not teach or disclose any needs or issues regarding
13 radio operation or interference at sector
14 boundaries."

15 To the extent a person of skill were to
16 surmise that Vornefeld even hypothesizes such a
17 problem, Vornefeld in fact provides its own
18 solution; it uses beamforming with narrow enough
19 beams that it can avoid interference at sector
20 boundaries.

21 Q Well, if you've only analyzed SDMA with
22 respect to a single sector, how do you come to any

1 conclusions regarding how Vornefeld deals with two
2 different sectors?

3 A I stated earlier I did not do an analysis
4 and I don't have an opinion --

5 Q Then --

6 A -- on Vornefeld's sector coordination,
7 other than it can -- a phone can -- a device can
8 sense its own interference without knowledge of
9 where that interference is coming from.

10 Q Well, I'm trying to understand here you're
11 saying that Vornefeld deals with interference
12 between sectors using SDMA, but at the same time
13 you're saying you haven't considered what happens in
14 other sectors. So I'm trying to reconcile those two
15 points of view, if you can help me out.

16 A I don't think there's anything to
17 reconcile. Vornefeld is a short paper; it says what
18 it says. I analyzed Vornefeld where Vornefeld had
19 something to analyze, and I did not analyze
20 Vornefeld where Vornefeld did not teach or disclose
21 anything. So my paragraph 74 says, "Vornefeld does
22 not teach or disclose any needs or issues regarding

1 radio operation or interference at sector
2 boundaries."

3 Q If Vornefeld uses beamforming to avoid
4 interference at sector boundaries, what's happening
5 in the next sector of Vornefeld to make that work?

6 MS. SPIRES: Object to form.

7 A That -- I have not done that analysis and
8 Vornefeld does not disclose that.

9 Q Okay. If you can look back at Vornefeld
10 at page 52, the bottom of the left-hand column under
11 the heading "Spacial Dimension."

12 A Yes, I see it.

13 Q And it says, "Every cellular mobile
14 communication system takes advantage of the spacial
15 dimension by reusing its transmission frequency at
16 appropriate geometric intervals."

17 Do you see that?

18 A Yes, I see that.

19 Q And what's your understanding of what
20 Vornefeld is referring to here?

21 A I'll use a trivial example. Are you
22 located in Washington, D.C.?

1 Q Yes.

2 A A base station in Washington, D.C. and a
3 base station in San Francisco could transmit on the
4 same frequency because they are far enough apart
5 that they won't interfere with each other. That's
6 an extreme example of what this is talking about.

7 That's why I was careful in my previous
8 discussions and comments to define SDMA as
9 different. SDMA as described by Vornefeld as
10 something different than the trivial, much older
11 scheme of simply geographically separating devices
12 to get isolation in the spacial dimension.

13 Q So you understand this to be just the
14 spacing of different cells in a system?

15 A Cell, but -- that's just referring to
16 geographic spacing of cells and base stations.

17 Q Okay. You discuss with respect to
18 Vornefeld and other references interference at the
19 sector boundaries. How is that relevant to the --
20 to claims 28 and 29, if at all?

21 A I would need to analyze that in a space
22 and a forum outside of this deposition to give you a

1 complete answer. I think there are a lot of things
2 that could interplay and affect it.

3 But one thing I will say is that I believe
4 that the interference at sector boundaries was also
5 a part of Dr. Almeroth's declaration, and one of my
6 assignments was to formulate opinions to potentially
7 rebut some of the things he says. So I think if
8 you're interested in where the interference at
9 sector boundaries comes from, we should start with
10 his declaration.

11 Q Let's go back to Vornefeld. We talked
12 about the idea that Vornefeld deals with
13 interference at sector boundaries using beamforming,
14 correct?

15 A That is one way that Vornefeld -- that is
16 a way that Vornefeld deals with interference,
17 period, including at sector boundaries.

18 Q And is another way that Vornefeld deals
19 with interference through TDMA, meaning separating
20 transmissions in time?

21 A Let me review Vornefeld.

22 Q And just to be clear, I'm just asking in

1 general whether TDMA as part of its design aids in
2 preventing interference when communicating with two
3 different devices.

4 A It can. I believe Vornefeld describes
5 that.

6 Q Now, with respect to Vornefeld's
7 boundaries between sectors, is it possible that two
8 devices could be in two different sectors, yet still
9 very close to each other at a sector boundary?

10 A Could you repeat your question?

11 Q Sure. In a sectorized system there are
12 different antennas dedicated to the different
13 sectors, correct?

14 A Yes. That is under the Court's
15 construction of sector.

16 Q And in beamforming and SDMA within a
17 sector, it's possible to transmit to different
18 devices using the same frequency if there is enough
19 spacial separation, let's call it. Is that fair?

20 A Yes, that's true.

21 Q One could have a possibility where there
22 is a device in one sector and a device in another

1 sector where those two devices are close to each
2 other because they are near a sector boundary,
3 correct?

4 A That is a possibility.

5 Q And with that possibility it might not be
6 advantageous to use SDMA because the two devices
7 might be too close together for that to be an
8 effective avoidance of interference. Is that fair?

9 A I wouldn't agree with that as stated.
10 Could you repeat your question?

11 Q Sure. If you have two devices near to
12 each other, but on opposite sides of a sector
13 boundary, there is a possibility that an SDMA
14 technique used in each sector could lead to
15 interference with respect to those two devices,
16 correct?

17 A That's a true statement.

18 Q And one way to avoid interference between
19 two devices that are near to each other at a sector
20 boundary is to transmit to them in different time
21 slots. Is that fair?

22 A Well, in hindsight, you're describing a

1 system that is beyond what Vornefeld describes.

2 Q Well, just to be clear, TDMA is about
3 transmitting to different devices and different time
4 slots, correct?

5 A But you're talking about cross sector
6 scheduling. We're -- we're getting into a much
7 bigger dimension, so we would have to analyze a
8 particular system. As I say, Vornefeld does not
9 discuss cross sector scheduling. That's a key point
10 of what I wrote in my declaration at paragraph --
11 Vornefeld -- yeah, let's see. I have it in my
12 declaration, Vornefeld -- and I can find it if you
13 want. Vornefeld describes and analyzes scheduling
14 in one ULA. He does not discuss cross ULA
15 scheduling it, it, Vornefeld, the reference does not
16 discuss cross ULA scheduling.

17 Q Just to be clear, cross sector scheduling
18 was known in the field, though, however, correct?

19 A I would not agree with that, especially at
20 that time frame.

21 Q Doesn't Atsuta describe cross sector
22 scheduling?

1 A I would not agree that Atsuta discusses
2 cross sector scheduling in the way that we are
3 describing dynamic scheduling for interference
4 avoidance. Atsuta just defines some time slots that
5 are fixed forever.

6 Q And forget about dynamic for right now.
7 I'm just trying to see if you agree with the general
8 proposition that Atsuta is describing cross sector
9 scheduling.

10 A I would not agree with that. Atsuta
11 defines an uplink framing scheme in order to share
12 circuitry, and, as a result of that, different
13 mobile subscribers may -- in different sectors may
14 transmit at different times. But I don't consider
15 that cross sector scheduling, nor does Atsuta.

16 Q All right. Just to be clear, you
17 acknowledge that Atsuta describes different mobile
18 subscribers may transmit at different times,
19 correct?

20 A Yeah, we'll refer to my declaration for
21 what I say about Atsuta.

22 Q Well, I just want to understand exactly

1 what you said. I believe you said that there were
2 transmissions to different subscribers, and that
3 those subscribers were in different sectors, and
4 that the transmissions were in different times.

5 Am I right on what you said?

6 MS. SPIRES: Object to form.

7 A I believe -- I believe I said -- well, I
8 make a statement -- I make statements about what
9 Atsuta describes. We'll go to that portion of my
10 declaration.

11 Q Let's -- let's finish with Vornefeld and
12 then we'll turn to Atsuta. I don't want to get us
13 off on the wrong track here. Let me finish with
14 Vornefeld and then we'll stop talking about that.

15 A Okay.

16 Q If you can look at page 53 of Vornefeld,
17 on the right column, the fourth bullet point, do you
18 see that?

19 A No. I'm still thinking about our previous
20 topic. It's all -- I'll state quickly for the
21 record that Atsuta uses different frequencies in
22 different sectors.

1 Okay. So back to Vornefeld, you want me
2 to go where?

3 Q Page 53, right-hand column, fourth bullet
4 point down.

5 A 53, right-hand column, fourth -- one, two,
6 three, four. Okay.

7 Q And there it talks about the MAC protocol
8 and it states that it permits a flexible frame
9 structure, correct?

10 A Yes.

11 Q And what does it mean to permit a flexible
12 frame structure?

13 A Are you okay if I pull up an unmarked
14 searchable version of Vornefeld, or do you want me
15 to read the whole thing?

16 Q That's --

17 A Or do you want me to drop a -- this one
18 doesn't appear to be searchable for me.

19 Q If you have a searchable version, that's
20 fine with me.

21 A Okay. Okay. I'm looking at Exhibit 1004
22 as it was dropped in the IPR package to me, that

1 version of Vornefeld is searchable. So let me
2 review through it.

3 I think what Vornefeld means by flexible
4 frame structure is what Vornefeld describes on page
5 54, left column, first section, "Medium Access
6 Control," where it says, "The resources are not
7 statically assigned to the individual MTs, but may
8 vary dynamically from frame to frame," and then
9 Vornefeld goes on to provide some further
10 explanation.

11 Q And in that same section, about two-thirds
12 of the way down, it states that Figure 3 shows a
13 possible frame structure. Do you see that?

14 A Yes. We discussed earlier that the
15 caption of Figure 3 describes it as a basic frame
16 structure of a MAC protocol.

17 Q And so does that indicate that other frame
18 structures are possible?

19 A Vornefeld further down says Figure 3 shows
20 a possible frame structure. I have not done any
21 analysis on if -- or if other frame structures are
22 possible or what other frame structures are

1 possible.

2 Q Okay. So looking at Figure 3, there are
3 slots there in both the downlink portion and the
4 uplink portion that are labeled SCH and LCH. Do you
5 see that?

6 A I see that.

7 Q And they are paired together, so it's SCH
8 and LCH, and then that apparently repeats as needed,
9 correct?

10 A That does appear to be the depicted
11 scheme.

12 Q And would it be your understanding that
13 those different pairs of SCH and LCH could be
14 assigned dynamically as discussed in the portion of
15 Vornefeld you just referred me to earlier?

16 We've been sitting in silence for a little
17 bit. Is there something you are specifically
18 looking for, or do you need me to repeat the
19 question?

20 A I'm looking through Vornefeld. I'll
21 always look first if Vornefeld answers your
22 question. If not, then I will provide my own

1 interpretation of Vornefeld.

2 I believe the answer to your question is
3 described by Vornefeld in its uplink scheduling and
4 downlink scheduling sections.

5 But please give me your question again.

6 Q With respect to those SCH and LCH pairs,
7 those are time slots that can be assigned to various
8 subscriber devices, correct?

9 A I don't agree with your question as
10 stated. SCH and LCH are described as short channel
11 and long channel.

12 Q Well, let's just focus on the long
13 channel, the LCH.

14 A Okay.

15 Q Those are different slots in time that can
16 be assigned to different subscribers as needed
17 depending on demand, correct?

18 A Please restate your question.

19 Q The Figure 3 shows those LCHs spaced apart
20 in time on the time axis, correct?

21 A That is how Figure 3 is depicted.

22 Q And on page 54 at the top left, Vornefeld

1 talks about the protocol granting transmission
2 capacity to the MTs, which are subscriber devices,
3 with a granularity of a single time slot according
4 to current transmission capacity demands.

5 So my question is those individual time
6 slots in the downlink phase and the uplink phase can
7 be assigned as needed to different subscribers,
8 correct?

9 A So you're talking about the slots, not the
10 channels.

11 Q Correct.

12 A Slots -- slots and channels are not
13 exactly the same thing.

14 Q I'm referring to LCH as used in the figure
15 to take up a space of a time slot.

16 A Okay. So, yeah, I believe that the
17 downlink scheduling section does provide your
18 answer. Yeah, it describes a decision algorithm
19 whereby sets of concurrently transmittable MAC PDUs
20 for one time slot, and those are -- those are linked
21 to be time slots that transmit the LCH, because
22 that's defined as the channel that serves to

1 transmit user data, the payload of the ATM cells,
2 which is essentially -- that essentially corresponds
3 to the MAC PDU.

4 So it sounds like Vornefeld's scheduling
5 algorithm could -- does in fact or is capable in
6 fact of assigning the MAC PDU slots designated LCH
7 to different users dynamically.

8 I believe that's the answer to your
9 question with all the right nomenclature.

10 Q So that would be an example, then, of an
11 asymmetry, because the slots might be assigned both
12 to different subscribers asymmetrically and may be
13 assigned asymmetrically for uplink and downlink. Is
14 that fair?

15 A No, I don't agree with that. You're
16 definitely mixing apples and oranges.

17 Could you ask a more -- could you ask a
18 narrower or more specific question?

19 Q If you look again at the same section on
20 the top left column of page 54, it states that "The
21 resources are not statically assigned to the
22 individual MTs, but may vary dynamically from frame

1 to frame."

2 So does that indicate that the time slots
3 might vary in their allocation from frame to frame?

4 A My previous answer was within the context
5 of downlink scheduling or uplink scheduling. Then
6 you started talking about asymmetry, which, as we've
7 gone through before extensively, is a different
8 thing. That's the -- that's the ratio between
9 uplink as a whole and downlink as a whole.

10 Q So do you have an opinion on whether or
11 not the uplink and downlink slots can be dynamically
12 assigned?

13 A As I've answered already, the uplink slots
14 can be dynamically assigned within the uplink and
15 the downlink slots can be dynamically assigned
16 within the downlink. That's what Vornefeld is
17 talking about with its uplink scheduling and its
18 downlink scheduling. I haven't done an analysis
19 about Vornefeld's discussion of changing the
20 asymmetry.

21 Q Would Vornefeld have to explicitly say
22 that for a person of ordinary skill in the art to

1 understand from existing knowledge in the field that
2 asymmetry in a TDD frame was possible?

3 A Well, you asked a different question.
4 Let's differentiate whether asymmetry is possible
5 and whether the dynamic changing of the asymmetry is
6 possible. Asymmetry was known. There may have been
7 systems that implemented it.

8 But the dynamic changing of uplink and
9 downlink, that's -- that was innovative for the
10 time. One would -- if Vornefeld didn't describe it,
11 and I don't think Vornefeld does describe it, I
12 don't form an opinion -- a person of skill wouldn't
13 read Vornefeld and say, oh, it's a no-brainer to
14 dynamically partition the uplink and the downlink.

15 Q But you agree that Vornefeld describes
16 dynamically apportioning the slots within the uplink
17 and within the downlink?

18 A That's described in Vornefeld's section on
19 uplink scheduling and Vornefeld's section on
20 downlink scheduling.

21 MR. OLIVER: All right. We've been going
22 for about an hour. So let's go off the record and

1 take a break.

2 (Recess 2:43 p.m. - 2:54 p.m.)

3 BY MR. OLIVER:

4 Q All right. Can you turn to Exhibit 1002,
5 paragraph 108.

6 A That's Dr. Almeroth's declaration?

7 Q Correct.

8 A And you said which paragraph?

9 Q 108, which spans pages 56 and 57.

10 A I'm there. Let me read it.

11 Okay. I am reading -- I have read
12 paragraph 108 of this declaration.

13 Q With respect to the annotated Figure 3 of
14 Vornefeld, which is shown at the very top of page
15 57, for context, I believe you agreed that Vornefeld
16 is -- or uses a TDMA approach, correct?

17 MS. SPIRES: Object to form.

18 A Vornefeld describes that it uses a joint
19 TDMA-SDMA approach. I found nothing to refute that.

20 Q And in a TDMA approach, transmissions to
21 different devices are spaced apart on the time axis
22 in different slots, correct?

1 A With the caveat that we may have to
2 consider exactly how the system is defined and
3 exactly how the slots are defined, I will give you a
4 qualified yes.

5 Q So my question concerning the annotated
6 figure with respect to the use of blue, green and
7 red, do you disagree with the concept set forth in
8 the annotations that transmissions to different
9 subscriber devices can appear in different time
10 slots in the downlink phase?

11 A So with all due respect, I don't want to
12 answer any questions with respect to this annotated
13 Figure 3 from Dr. Almeroth. I'll give you the
14 reasons for that.

15 We can go back to the native Figure 3 of
16 Vornefeld if you wish, because Dr. Almeroth, first
17 off, he calls it a single -- okay. Let's see. Now,
18 I don't -- as we've discussed before, I don't agree
19 that -- I don't agree with any concept of a single
20 downlink TDD frame into Vornefeld's system and
21 have -- and then, but the bigger thing is in that --
22 the blue, green and red downlink data in Vornefeld

1 Figure 3 showed downlink data transmitted to
2 subscribers in different sectors. I definitely
3 don't agree with that.

4 So I think if you're going to -- if you're
5 going to ask questions, let's just go back to the
6 native Vornefeld in Figure 3 and you can -- I can
7 understand if you want to hypothetically
8 differentiate --

9 (Simultaneous speaking.)

10 A -- differentiate certain things in
11 Vornefeld Figure 3. I can probably understand that.

12 Q Let's stick with the annotated one. So it
13 sounds like your disagreement with the annotated
14 version is whether the different subscribers are in
15 different sectors. Is that fair?

16 A That's one thing that I pointed out.

17 Q So on that, if we were to assume one
18 sector, would you disagree that the blue, green and
19 red could represent transmissions to different
20 subscribers within the same sector over the time
21 axis?

22 A All I can say is, number one, I do want to

1 refer to Vornefeld's native Figure 3. And number
2 two, Vornefeld describes the concept of space, time
3 and scheduling, that is -- it's described
4 point-blank, and the concept of space, time
5 scheduling does allow the scheduling algorithm to
6 dynamically choose capacity in space and in time for
7 different users.

8 Q Okay. So let's look then at Figure 3 in
9 Vornefeld itself. Just for clarity, I think we
10 already discussed this a little bit, but I want to
11 make sure we're on the same page. There is the
12 spacial domain which goes back into the figure,
13 correct?

14 A Yes, that is correct, that's the space
15 aspect of space time.

16 Q And on the x-axis I'll call it, we have
17 time, correct?

18 A Yes, that's correct.

19 Q Okay. And we've already discussed that
20 there are different time slots, and I'm just going
21 to refer to the first or closest set of slots in the
22 figure. So not in the spacial dimension, but just

1 taking the very first row in the spacial dimension.

2 All right?

3 A I understand.

4 Q So there are time slots across that row in
5 time, and I think we agreed earlier that those could
6 be assigned to different subscribers or subscriber
7 devices?

8 A That is correct.

9 Q Okay. And with respect to the spacial
10 dimension, there could be transmissions in the same
11 time slot if there is adequate spacial separation to
12 allow for that, and that would be part of the SDMA
13 approach, correct?

14 A Yes. That's a teaching of Vornefeld.

15 Q Now, still looking at Figure 3 of
16 Vornefeld, we have something going on between the
17 downlink portion and the uplink portion, there's an
18 unlabeled slot and then pilot tones. What's your
19 understanding of those?

20 A So in searching for pilot tones, pilot
21 tones are -- pilot tone by itself is a fairly
22 general concept that can be designed for or can mean

1 different things, be designed for different things.

2 What Vornefeld describes is an additional
3 pilot tone phase to support accurate uplink spacial
4 parameter estimation. So it's a channel. So the
5 pilot tones are used for channel estimation. And
6 then the gap is whatever space the system needs.
7 Again, I don't think Vornefeld describes that gap;
8 it's not labeled. But it's just some amount of time
9 that the system can use to switch between downlink
10 and uplink.

11 Q And why is that important?

12 MS. SPIRES: Object to form.

13 A A person of skill at the time of the
14 patent and this prior art would know that a system
15 can't switch immediately and work properly for
16 reasons that are -- that may be related to the
17 internal hardware and for reasons that may be
18 related to radio transmission and reception.

19 Wait, hold on. I have to back off of
20 that, though. That gap is not between the -- I have
21 to retract that, or at least clarify that answer
22 further.

1 The gap is called TTA. Okay. So we
2 better -- let's make sure we're in synchronization.
3 There's a gap between the downlink and the uplink
4 phase that's labeled TTA. Do you agree with that?

5 Q So you're saying that the TTA is what you
6 were just referring to as the timing gap between
7 uplink and downlink?

8 A That appears what it is. Let's see -- at
9 least that appears to me at least in Figure 3 as how
10 Vornefeld intends it, because you can see how -- see
11 how the dotted arrows go up to where it says
12 downlink phase and uplink phase, and the TTA appears
13 to be sandwiched -- sandwiched in between them
14 somehow magically taking no time in the upper
15 diagram, but taking time in the lower diagram. I
16 don't know if Vornefeld says what the TTA is --

17 Q Well, in the figure itself it says in the
18 bottom right-hand corner of the figure TTA is the
19 transceiver turnaround time?

20 A Okay. So there it's the -- so that would
21 refer to the time that the hardware spends switching
22 from downlink transmission to uplink reception.

1 Q And I don't see it, but I want you to
2 correct me if I'm wrong, I don't see anything in
3 claims 1 or 28 of the '931 patent that specify any
4 timing requirements between the uplink and downlink
5 of the TDD frame. Is that your understanding?

6 A That sounds identical to a question you
7 asked me about two or three hours ago. And I
8 replied then that, generally speaking, the claim
9 language does have concepts of time even if it's at
10 least with respect to its recitation of TDD.

11 For any further analysis, I would have to
12 do a long analysis to understand what a person of
13 skill would think in reading the claims in light of
14 the specification.

15 Q Okay. I'm not sure if the question I
16 asked earlier was the same. But just so we're on
17 the same page, you did mention earlier that there is
18 a TDD frame and that would indicate to a person of
19 ordinary skill in the art that there is an uplink
20 phase and a downlink phase, correct?

21 A Yes. I think that -- I think that the
22 '931 patent is clear and Vornefeld is clear on the

1 TDD concept having a Vornefeld calls it an uplink
2 phase, and the downlink phase I believe the '931 may
3 use the word "portion."

4 Q And from the discussion we just had, a
5 person of ordinary skill in the art would understand
6 that there would be some sort of spacing between the
7 uplink and downlink phases which Vornefeld refers to
8 as TTA. Is that fair?

9 A Could you ask your question again exactly?

10 Q Yeah. I'm not trying to change anything
11 you said. But my understanding from what you
12 explained is that a person of ordinary skill in the
13 art would understand, as shown with the example of
14 TTA in Vornefeld, that there is often spacing
15 between the uplink and downlink phases, because,
16 technologically speaking, it can't switch -- can't
17 switch immediately and there's often a space in
18 between. Is that fair?

19 A Let me qualify. Your question, two
20 questions -- your question before this one was about
21 the claim language. So now you've moved away from
22 the claim language. You're just talking about a

1 person of skill's general understanding of TDD
2 systems?

3 Q Well, just -- I'm glad you asked that so
4 that we're on the same page. I asked about timing
5 with respect to claim 1, and you said there are
6 aspects of timing because of the appearance of the
7 term "TDD frame."

8 A I said at least because of the occurrence
9 of the phrase "TDD frame" and that I would need to
10 do a full analysis of every claim word in light of a
11 person -- every claim word and a person of skill's
12 understanding of every claim word in light of the
13 specification.

14 And then I think your next question was
15 just more general, would a person of skill building
16 a TDD system understand that you might have to have
17 a gap. Yeah, that's -- the answer to that is yes.

18 Q And so that's I guess where the questions
19 come together. You were seeming to say that a
20 person would understand certain timing requirements
21 based on the use of the term "TDD frame."

22 So is it fair that one of those

1 understandings that a person would have from the use
2 of the term "TDD frame," that there would be some
3 sort of gap between the uplink and downlink?

4 A I wouldn't agree with that. We're talking
5 about two different things now. All I said about
6 the claim language itself is that the TDD frame
7 indicates a downlink portion and an uplink portion.
8 I don't believe -- again, it would require a full
9 analysis for me to analyze and assess and come to
10 the conclusion -- come to the conclusion or not that
11 claim 1 encompasses -- yeah, encompasses a gap or
12 requires a gap. As I sit here right now, I don't --
13 I don't see that.

14 But, again, I would need a -- I would need
15 to do much more analysis than -- than I have time
16 for here to come to any conclusion of timing about
17 the claim language other than the use of TDD does
18 indicate an uplink portion and a downlink portion.

19 Q All right. Just to be clear, is there
20 anything else that just the appearance of the term
21 "TDD frame" indicates with respect to timing of the
22 uplink and downlink portions?

1 MS. SPIRES: Object to form.

2 A Yeah, as I -- same answer, as I sit here
3 right now, I can't provide any additional answer or
4 details without a complete analysis.

5 Q Okay. And is there anything else in claim
6 1 or 28 that indicates the timing, and more
7 specifically, the coordination of the timing of the
8 uplink and downlink communications?

9 MS. SPIRES: Object to form.

10 A Could you repeat your question again?

11 Q Is there anything else in claims 1 and 28
12 that indicates any coordination of timing between
13 the uplink and downlink communications?

14 MS. SPIRES: Object to form.

15 A Yeah, I would -- same answer. I would
16 need to do an offline analysis. There's a lot of
17 other terms in there that may -- that may have an
18 effect.

19 Q But you haven't done that analysis yet?

20 A That is correct.

21 Q Okay.

22 A If it's not in my declaration, I have not

1 done that analysis.

2 Q Could you turn to paragraph 114 of your
3 declaration.

4 A I'm there.

5 Q The third sentence down you state in part,
6 "the only interference problem recognized by
7 Vornefeld is that concurrently transmitted directed
8 beams can interfere with each other," correct?

9 A I do state that citing Vornefeld.

10 Q And what do you mean there by "recognize"?

11 A Let me search Vornefeld.

12 I'm having trouble searching Vornefeld,
13 even my version that I thought was searchable. Let
14 me take some time here.

15 Okay. Let's go back to your question.

16 Q My question is when you state that "the
17 only interference problem recognized by Vornefeld is
18 the concurrently transmitted directed beams can
19 interfere with each other," what do you mean by
20 "recognized"?

21 A The only problem that -- that's the only
22 problem that Vornefeld discusses as a problem it is

1 trying to solve.

2 I just searched "interference" in
3 Vornefeld, and there's one -- I saw one instance
4 where it talks about beamforming reducing
5 interference in other cells.

6 But except for that, all of the instances
7 in Vornefeld that discuss interference are talking
8 about intercell interference between the MTs that
9 are involved in the space division scheme. So
10 that's what I -- that's what I meant.

11 Q And what's the one reference that you
12 found for interference that is intracellular?

13 A Let's see. There's -- there's one on page
14 55, it says the transmit -- page 55, left column
15 around the middle, it says, "The transmit power of
16 each beam can be adjusted, helping to reduce the
17 total array output power and to decrease
18 interference in neighboring cells."

19 So that's not a problem that Vornefeld is
20 addressing with its scheme. That's just saying
21 sometimes you can reduce the total power, so that's
22 going to have a less deleterious effect on other

1 cells.

2 But the other eight or nine instances of
3 interference talk about interference limited,
4 carrier to interference ratio, interference hours at
5 the other K minus 1 MT that are being scheduled.
6 Then at one point it actually -- it literally talks
7 about intracell interference.

8 So that's what I meant when I said the
9 only interference problem that Vornefeld discusses
10 and addresses in its -- in its invention of SDMA,
11 TDMA is the interference within a cell between the
12 spacially scheduled devices.

13 Q So the interference that it focuses on is
14 that between different devices in different spaces.
15 Is that fair?

16 A Well, it could be -- I would narrow it. I
17 wouldn't say -- I wouldn't answer a question that
18 general yes.

19 But we could say, you know, all of the --
20 all of the devices within a -- within a ULA coverage
21 pattern being scheduled under one of Vornefeld's
22 downlink scheduling algorithms, as described in page

1 56 on the left side where it literally talks about
2 -- I see item number 2, determining the
3 corresponding interference powers at the other K
4 minus 1 mobile terminals.

5 Q Just so we're clear, though, a person of
6 ordinary skill would understand that that's not the
7 only interference that a designer has to worry
8 about; that there are other places where
9 interference can take place, correct?

10 A Within the entire area of cellular system
11 design?

12 Q Yes.

13 A Yeah, there are -- it's no secret that a
14 person of skill knows about intracell interference.

15 Q And would it also be fair to say that a
16 person of ordinary skill would know about
17 interference between boundaries?

18 A That's -- I can't answer your question as
19 stated. What do you mean by "boundaries"?

20 Q Sector boundaries.

21 A So please restate your question.

22 Q Would a person of ordinary skill in the

1 art understand that interference could occur at
2 sector boundaries as well?

3 A Let me divide your question into two. I
4 can't answer yes or no without at least one
5 clarification question. Is the transmission -- are
6 those transmissions on the same frequency at the
7 same time?

8 Q Let's -- well, let's consider two options.
9 One, same frequency, same time. And the other,
10 adjacent frequencies at the same time.

11 A Okay. So a person of skill would -- I
12 think even in 1999, even in the late '90s, a person
13 of ordinary skill would at least acknowledge that
14 there may be interference if two devices in two
15 sectors -- well, even that, if -- I'll put it this
16 way. If two devices are being serviced as -- if two
17 devices are being serviced as though they are in
18 different sectors, and they are close together and
19 there's a transmission at the same frequency and
20 time, then a person of skill may recognize that
21 there is an interference problem.

22 If it's a different frequency or a

1 different time, then no, the person of skill is
2 going to say no problem, they're orthogonal.

3 Q What if they're adjacent frequencies?

4 A That's -- I would have to analyze a
5 particular system. I mean, how adjacent, what does
6 adjacent mean, and what does the whole rest of the
7 system design look like. That would depend on a lot
8 of different factors, so we would have to do a
9 complete analysis.

10 Q And one last question and we can take our
11 lunch break. I think we discussed earlier today
12 that TDMA, because it separates transmissions on the
13 time axis, is a way to avoid interference when
14 communicating with two different devices, correct?

15 A That is --

16 MS. SPIRES: Object to form.

17 THE WITNESS: Sorry. Go ahead, Sarah.

18 MS. SPIRES: Go ahead.

19 A I think that's an inherent property of
20 TDMA. That's one of the reasons you do it.

21 MR. OLIVER: All right. With that, why
22 don't we go off the record.

1 (Recess 3:31 p.m. - 4:29 p.m.)

2 BY MR. OLIVER:

3 Q Dr. Chrissan, can you turn to Atsuta,
4 please.

5 A Yes.

6 Q And specifically, the bottom of column 3
7 starting at line 66.

8 A Yes.

9 Q And the sentence there states, "In
10 addition, time slots are assigned to the divided
11 zones so that the time slots do not overlap. Thus,
12 when the powers of the same intermediate frequency
13 are combined, data of different divided regions can
14 be prevented from colliding."

15 Do you see that?

16 A Yes.

17 Q Okay. And the collision, is that a type
18 of interference?

19 A What it's referring to here when it says
20 colliding is, I believe, referring to what's
21 actually happening in the hardware. We can go
22 through what's happening in the hardware in detail.

1 But I -- let me think about this. I think colliding
2 is not used in the context of interference here.

3 Give me -- give me a little bit of time.

4 For your reference, I'm reading column 4
5 at line 58 where it starts, "Next, the structure of
6 the indoor unit 1 will be described in detail."

7 Almost there.

8 Okay. So you asked about the sentence at
9 the top of column 4 where it says, "Thus, when the
10 powers of the same intermediate frequency are
11 combined, data of different divided regions can be
12 prevented from colliding."

13 So, if you go down to column 5 at line 2,
14 "The first to third second-frequency converters
15 convert the first three first-intermediate frequency
16 signals into second intermediate frequency signals
17 with the same frequency." So it's the output of 7A,
18 B and C where you get the intermediate frequencies
19 with the same -- you get the intermediate signals
20 with the same frequency.

21 So then we have to go back to Figure 2 and
22 the outputs of 7A, B and C go into the combining

1 unit and the combining unit simply adds them up. So
2 that's where it's talking about collisions, it's
3 talking about a collision that would happen in the
4 combining unit 10, so, and this is all in the
5 uplink.

6 So I would have to do some analysis to
7 come up with a final opinion as to how that related
8 to interference as it's used elsewhere.

9 Q Well, if you could take a look, you kind
10 of skipped over the sentence before that I read,
11 which said, "In addition, time slots are assigned to
12 the divided zones so that the time slots do not
13 overlap. Thus," and then it goes on to the sentence
14 you read.

15 So how does assigning transmissions to
16 different time slots accomplish what follows, which
17 is the avoidance of collision?

18 A Okay. So you're saying forget about the
19 use of the word "interference," let's talk about the
20 word "collision." Is that a fair statement?

21 Q No. I am asking specifically what is
22 being described in those two sentences where one

1 says that the time slots are divided so that they
2 don't overlap, and thus, that achieves prevention of
3 collision.

4 A Okay. So I think that's answered by what
5 I pointed to before. Let's go to Figure 2. Are you
6 there?

7 Q Yes.

8 A Go to Figure 2 of Atsuta. Do you see the
9 7A, 7A prime, 7B prime, and 7C prime, the second
10 frequency converters?

11 Q Yes.

12 A Okay. Atsuta describes that the frequency
13 band going -- the frequency band going into 7A prime
14 is different than the frequency band 7B prime, which
15 is different than the frequency band going into 7C
16 prime. But the second frequency converter 7A, 7B
17 and 7C are specifically designed to frequency shift.
18 They convert the frequencies such that at their
19 outputs the frequencies are the same.

20 So what that means is if -- you know,
21 Atsuta says -- let me go back. Atsuta says, "In
22 addition, time slots are assigned to the divided

1 zones so that the time slots do not overlap."

2 Going back to Figure 2, if that were not
3 the case, and the time slots were not allocated --
4 what does Atsuta say again. Do not -- okay.

5 Atsuta says the time slots do not overlap.
6 If Atsuta did not follow that scheme and certain
7 time slots were allowed to overlap, then when the
8 second frequency converters all converted their
9 signals to the same frequency and the combining unit
10 combined them, that's where you would have the
11 collision, that's what Atsuta is saying.

12 So in order to avoid collisions in
13 combining unit 10, Atsuta assigns the time slots so
14 that they do not overlap. That's what's going on
15 with Atsuta right there.

16 Q And just to be clear, we talked about
17 earlier today the idea that TDMA provides different
18 time slots so that there's not interference among
19 communications with different devices, correct?

20 MS. SPIRES: Object to form.

21 A We described TDMA as a multiple access
22 protocol. In terms of its needs and benefits, we

1 can discuss that in a -- in a given system.

2 Q I'm just asking whether we already
3 discussed today and you acknowledged that the use of
4 different time slots in a TDMA system prevents
5 interference between communications with different
6 devices.

7 MS. SPIRES: Object to form.

8 A At most, I would have said that's one
9 possible benefit. We can go back to Rappaport.

10 Q We don't need to. It's all in the record,
11 so the judges will see it.

12 A Okay.

13 Q If you could look at paragraph 114 of your
14 declaration. Are you there?

15 A Yes, I'm there.

16 Q The third sentence states, "Regarding the
17 first sentence, the only interference problem
18 recognized by Vornefeld is that concurrently
19 transmitted directed beams can interfere with each
20 other," correct?

21 A We discussed that previously, that's the
22 only interference problem that Vornefeld attempts to

1 address.

2 Q And then you go on to state that "Atsuta
3 does not provide a solution for this, in part
4 because Atsuta does not discuss beamforming at all,"
5 correct?

6 A That's correct.

7 Q So is it your understanding that in order
8 for a combination to be proper, the primary
9 reference has to identify the same problem that the
10 secondary reference identifies?

11 MS. SPIRES: Object to form.

12 A I would want to read my legal overview
13 section and then we'll come back to your question.

14 Q Okay.

15 So we have been sitting here in silence
16 for about four minutes now. Do you need help
17 finding anything?

18 A I've read through the whole section. I'm
19 going back and rereading a couple things.

20 Okay. What was your question?

21 Q So in paragraph 114 it seems that you take
22 the position that because Vornefeld solves a

1 specific interference problem, a person of ordinary
2 skill would not look to any other reference for
3 another interference problem, and I'm just trying to
4 understand your logic.

5 MS. SPIRES: Object to form.

6 A If we look at paragraph 114 from the top,
7 the purpose of this paragraph is to rebut something
8 that Dr. Almeroth stated. Dr. Almeroth stated a
9 POSA would have been motivated to combine Vornefeld
10 and Atsuta because Atsuta provides a solution to a
11 transmission problem -- to a transmission
12 interference problem recognized by Vornefeld. I'm
13 simply refuting that. I don't have any other
14 motivation here other than to refute that statement.

15 Q But it sounds like you're limiting
16 interference to only interference in beamforming.
17 Is that fair?

18 MS. SPIRES: Object to form.

19 A I would need to go back and read
20 Dr. Almeroth's declaration in context --

21 Q Just to be clear, I'm asking about your
22 statement in 114, specifically the third paragraph

1 says, "the only interference problem recognized by
2 Vornefeld is that concurrently transmitted directed
3 beams can interfere with each other."

4 A Yes, I'm -- yes, that's a follow-on
5 interpretation of Dr. Almeroth's statement.
6 Dr. Almeroth says -- Dr. Almeroth refers to a,
7 quote, interference problem recognized by Vornefeld.

8 So I'm -- given his declaration, I have to
9 think about and assess and try to come up to -- come
10 up with my interpretation of what he's talking
11 about. And so I go to Vornefeld and look at what
12 Vornefeld discusses about interference problems and
13 then we get back to a discussion that we had before
14 lunch.

15 Q So interference in Vornefeld is
16 interference between communications to different
17 devices, correct?

18 MS. SPIRES: Object to form.

19 A We're going through something we've gone
20 through before. So I'll need to go through the same
21 process to get you the answer. Let me search for
22 interference in Vornefeld.

1 Q Just so we're clear, do you not know right
2 now sitting here whether Vornefeld addresses
3 interference with respect to transmissions to
4 different devices?

5 A I can't answer your question without
6 clear -- sorry. I can't answer your question
7 without a clearer definition of parameters of your
8 question. If you want to narrow it a little bit,
9 then maybe I can answer yes or no. But we already
10 had a long discussion about this on the record.

11 Q And I'm just asking for confirmation that
12 the interference discussed in Vornefeld has to do
13 with interference concerning transmissions to
14 different devices, correct?

15 MS. SPIRES: Object to form.

16 A I would qualify that as devices within the
17 same ULA or space time scheduling set.

18 Q Now, would a person of ordinary skill in
19 the art understand that interference problems can
20 come up in a host of areas in cellular communication
21 systems?

22 MS. SPIRES: Object to form.

1 A That question is so general. Could you --
2 are you just saying is there interference in
3 cellular systems?

4 Q More specifically, would a person of
5 ordinary skill in the art understand that there are
6 a number of interference issues in cellular
7 communication systems?

8 MS. SPIRES: Object to form.

9 A That depends on how you look at it.
10 Depending on how you look at it. It depends on how
11 a cellular engineer looks at the system. Do you
12 mean sources of interference -- anyway, there's lots
13 of different ways to answer that question and lots
14 of different ways to look at it.

15 If you can give me a narrower question,
16 I'll try to give you a narrower answer.

17 Q I think the question is pretty clear.
18 Would a person of ordinary skill in the art
19 understand that there are a number of potential
20 interference issues in cellular communications,
21 including different issues concerning the
22 communications among different subscriber devices?

1 MS. SPIRES: Object to form.

2 A I can't answer that question yes or no.
3 It depends on the system. We already discussed --
4 we discussed TDMA and FDMA. If those systems are
5 implemented in certain ways, then there's no
6 interference; it's not an issue.

7 Q Could there be interference problems even
8 in systems that don't use beamforming?

9 A Again, I have to qualify that your
10 question is so general. An improperly designed
11 system could have interference, whereas a properly
12 designed system would not.

13 Q And just to be clear --

14 A It's a very general question.

15 I got to get some water.

16 Go ahead.

17 MS. SPIRES: Please allow him to finish
18 his answers.

19 Q And just to be clear, that is regardless
20 of whether the system uses beamforming or not,
21 correct?

22 MS. SPIRES: Object to form.

1 A Go back -- go back to your original
2 question and ask me the whole question from scratch.

3 Q Even if the system does not use
4 beamforming, would, for instance, TDMA be a way to
5 prevent interference problems?

6 MS. SPIRES: Object to form.

7 A I would say yes to that. That's
8 fundamental to the purpose of TDMA.

9 Q And in Vornefeld's system it uses both
10 SDMA and TDMA, correct?

11 A That is correct.

12 Q So even Vornefeld acknowledges that
13 sometimes beamforming will not solve interference
14 problems, and when beamforming can't be used, TDMA
15 is used to prevent interference, correct?

16 A Let me review Vornefeld.

17 Q And I'll direct you to a specific place.
18 If you look at page 55, the second column, the last
19 sentence.

20 A Yes, I see it.

21 Q So that indicates that separation on the
22 time axis can be used when separation in space is

1 not an option.

2 A Vornefeld does make that statement.

3 Q And that would be an example of when
4 someone could use TDMA to prevent interference
5 versus using SDMA to prevent interference.

6 A I can't answer that as stated. I'm seeing
7 if I can come up with a -- I think it's best just to
8 take Vornefeld's statement as is, "another objective
9 of the scheduling algorithm is to split up
10 transmission constellations on the time axis, which
11 cannot be separated in space."

12 Q Okay. Can you turn to paragraph 117 of
13 your declaration. Let me know when you're there.

14 A Yes, I am there.

15 Q So the first sentence states, in part,
16 that Atsuta teaches away from TDD, beamforming and
17 SDMA, correct?

18 A Correct.

19 Q What do you mean by teaches away from each
20 one of those? And more specifically, let's take
21 them one at a time.

22 Why would Atsuta teach away from TDD?

1 A Because, as described in my declaration in
2 a number of places, Atsuta is clearly FDD, and
3 Atsuta provides no guidance for any teaching that
4 would refer to TDD.

5 Q So in your opinion, Atsuta is silent as to
6 TDD?

7 MS. SPIRES: Object to form.

8 A Yeah, Atsuta is so strongly FDD, and they
9 are opposites. We already discussed, you know,
10 Rappaport says you use one or the other. Atsuta
11 provides no guidance, nor would -- I didn't see
12 anything in Atsuta's system that a person of skill
13 would recognize as amenable to TDD.

14 Q Your opinion is that Atsuta is a TDMA
15 reference, correct?

16 A My opinions about Atsuta start at
17 paragraph 76. I do say Atsuta is directed to a TDMA
18 method and TDMA receiving apparatus, so it is -- it
19 is directed -- it is at least directed to a TDMA
20 method and TDMA receiving apparatus.

21 Q And you would agree that TDMA methods can
22 also use TDD. Is that right?

1 MS. SPIRES: Object to form.

2 A As described in Rappaport, there are TDMA
3 systems that employ TDD, and there are TDMA systems
4 that employ FDD.

5 Q So TDMA is compatible with both TDD and
6 FDD.

7 A If you are designing a system from
8 scratch, you could choose either FDD with TDMA or
9 TDD with TDMA. That's clearly stated in Rappaport.

10 Q So then back to paragraph 117, what's your
11 basis for saying that Atsuta teaches away from TDD?
12 Is it just that it doesn't, in your opinion, discuss
13 TDD?

14 A No, it's more than that. I'm not able to
15 find anything in Atsuta that would make it possible
16 to convert it to a TDD system without -- not having
17 Atsuta's invention anymore, you would have to
18 completely start from scratch and you would have
19 something totally different.

20 So that's -- that's the base -- I think
21 that's the key basis why I said Atsuta teaches away.
22 It's not the case that a person of skill would look

1 at Atsuta's teaching and think, you know, oh, I
2 could easily change a couple things, or I could
3 change that system to a TDD system without undue
4 experimentation.

5 A person of skill would look at Atsuta's
6 invention and say if -- first off, I mean, the
7 person wouldn't even think TDD in the first place.
8 I say that in my declaration.

9 But if a person of skill were to look at
10 Atsuta, as I did, and think, you know, what would I
11 have to do to make this a TDD system, it's -- it
12 would be a complete rip up and start over. It
13 wouldn't be Atsuta's system anymore. That's why I
14 say Atsuta teaches away from TDD.

15 Q Correct me if I'm wrong, Atsuta doesn't
16 explicitly mention FDD either, does it?

17 A Atsuta provides enough evidence that a
18 person of skill knows it's an FDD system. I explain
19 that in my declaration. We can go to those sections
20 if you wish.

21 Q That's all right. Let's go back to that
22 later.

1 Sticking, though, with paragraph 117, you
2 also say that Atsuta teaches away from beamforming.
3 Can you explain to me how Atsuta teaches away from
4 beamforming?

5 A Let's go to Atsuta. I have my answer, but
6 let me look at my declaration as well.

7 So I will, in addressing your question, I
8 will cover spacial division multiplexing as well,
9 because beamforming and spacial division
10 multiplexing somewhat go hand-in-hand, although I
11 can address them separately if you wish.

12 So Atsuta has no concept of spacial
13 division multiplexing, because, as I said, as we've
14 talked about earlier, a key feature of spacial
15 division multiplexing and the beamforming that
16 enables it is the ability to communicate
17 simultaneously with devices that are separated in
18 the spacial domain. And Atsuta is very much a
19 teaching of no two devices communicate at the same
20 time. That's in my declaration as well. Let me go
21 get the specific language.

22 But that would be -- that's the gist of my

1 answer to that one. That's not my only reason, but
2 it's certainly a key one.

3 Q And the communication not taking place at
4 the same time is because Atsuta is a TDMA method.
5 Is that correct?

6 A I'll answer your question. My paragraph
7 78 says, "Atsuta teaches that uplink signals from
8 each wireless device to the base station must be put
9 in a separate portion of a TDMA frame, so they are
10 each transmitted in a separate time slot so they 'do
11 not overlap.'" I think that answers your question.

12 Another way that Atsuta teaches away is
13 that its antenna system and its hardware have no
14 support for beamforming or SDMA. We can get into
15 that if you want. I'm sure that's in my declaration
16 as well. And, again, to add, it would be a complete
17 rip up and start over.

18 Q Let's take those one at a time. You would
19 agree that TDMA and SDMA are compatible such they
20 could be used together in the same system?

21 MS. SPIRES: Object to form.

22 A Could you repeat your question?

1 Q Would you agree that a person of -- person
2 of ordinary skill would understand that TDMA and
3 SDMA are compatible such they could be used in the
4 same system?

5 A I would agree they can be used in the same
6 system. Vornefeld does that. To address compatible
7 is a different topic, but they can -- they can work
8 together.

9 Q Okay. So it seems that your problem with
10 Atsuta is that it is silent on any SDMA or
11 beamforming, correct?

12 MS. SPIRES: Object to form.

13 A Well, it's more than that. That's similar
14 to the question you asked me about, I believe,
15 antenna array, or whatever the first topic was. Not
16 only does it not mention it, but the way it's
17 designed leaves no window for a person of skill to
18 add beamforming or spacial division multiplexing
19 without completely starting over and with a system
20 that would no longer be Atsuta.

21 Q Why does Atsuta need to have beamforming
22 if Vornefeld already does in the combination?

1 A Let's wind back to where we started, which
2 was a rebuttal of Dr. Almeroth's declaration. What
3 was the paragraph when we -- that you pointed me to
4 in my declaration where I recite him that first
5 started this line of questions, was it --

6 Q I'm not asking about Dr. Almeroth's
7 testimony.

8 I'm just asking you why would a secondary
9 reference such as Atsuta need to teach beamforming
10 if the primary reference Vornefeld already does?

11 MS. SPIRES: Object to form.

12 A That's -- I don't have an opinion on that.
13 My opinion -- my opinions are in my declaration, and
14 we started with a paragraph that's a rebuttal of a
15 section of Dr. Almeroth's declaration.

16 Q Okay. Can you turn to paragraph 122 of
17 your declaration.

18 A Yes.

19 Q So in connection with that paragraph, you
20 compare the prior art figure in Atsuta, which is
21 Figure 1, with Atsuta's improved design, which is
22 Figure 2, correct?

1 A I do show them side by side.

2 Q And in the prior art design in Figure 1,
3 there are three TDMA control circuits, 9A through
4 9C, correct?

5 A Yes, that is correct.

6 Q And in the improved design of Figure 2
7 there is a single TDMA control circuit 9, correct?

8 A As pictured in this block diagram, that is
9 correct.

10 I will qualify that the TDMA control
11 circuit 9 is not the same internal circuit as the
12 TDMA control circuits 9A, B and C. I address that,
13 I believe.

14 Q And when you say it's not the same, is
15 that because the new TDMA control circuit in Figure
16 2 performs the functionality of all three TDMA
17 control circuits 9A through 9C in Figure 1?

18 A At a layperson level, that's what I would
19 say. And as a -- in a more detailed engineering
20 standpoint I discuss it, I believe, in my
21 declaration some of the more -- some of the reasons
22 for that.

1 Q Can you turn to paragraph 83 of your
2 declaration. Are you there?

3 A Almost. Yes, I see it.

4 Q In the last sentence you refer to
5 associated trade-off costs in adopting Atsuta's
6 design. Do you see that?

7 A Yes, I do.

8 Q What are the trade-off costs you're
9 referring to?

10 A Let's go to Section 7.F, it is -- it's
11 primarily summarized at paragraph 129: To
12 summarize, Atsuta's "optimization" would not make
13 sense to a person of skill in light of the fact
14 that, number 1, the combining unit 10 is a new
15 design and the TDMA controller circuit has 9 --
16 three times more outputs, combining unit 10, control
17 circuit 9 and the demodulating circuit 8 run at a
18 three times higher clock rate, additional frequency
19 spectrum must be utilized and paid for, with
20 two-thirds of it being wasted because each band is
21 only used one-third of the time, Atsuta recognizes
22 that.

1 And 4, the frequency -- this is a big one,
2 number 4, the frequency converters, LNAs and receive
3 antennas are much more -- the word "more" is
4 complex -- I'm sorry, the word "more" is left out.
5 What I meant was the frequency converters, LNAs and
6 receive antennae are much more complex due to
7 supporting three times the bandwidth, and they are
8 all being used at one-third capacity, i.e.,
9 one-third of the time. Those are the trade-offs.

10 I also have a footnote 6 that gives a
11 little note about how I would -- how a person of
12 skill would really optimize the system.

13 Q Back to trade-offs, though, that term
14 "trade-off costs" seems to be that there are things
15 that you would give up in order to do what Atsuta is
16 asking for.

17 So are you saying that what's provided
18 there in paragraph 129 are things that would be
19 sacrificed to do what Atsuta is calling for?

20 A I use the term "trade-off costs." So
21 these things represent additional costs that would
22 be incurred if one were forced to implement Atsuta's

1 invention.

2 Q Can you look at Atsuta column 3, line 61
3 through 63.

4 A You said column 3?

5 Q Yes.

6 A Okay. It says, "Thus, the size of the
7 receiving apparatus can be reduced and thereby the
8 power consumption can be decreased."

9 Q Do you disagree that Atsuta's system could
10 provide those two features?

11 A It's possible that the size of the
12 receiving apparatus could be reduced. And I make
13 that statement in my own declaration at footnote 6.

14 I do not think that the power would be
15 reduced for the reasons that I describe.
16 Tripling -- tripling the frequencies of all of the
17 analog front-end devices, yeah, all the things I
18 describe, all of those circuits that run at three
19 times higher clock rate, and the fact that the
20 combining unit, the fact the control circuit has
21 three times more outputs, I believe that that would
22 actually not save power, probably end up with more

1 power consumption.

2 Q Well, let's get to that. But before we
3 do, let's look at footnote 6 that you've referenced.
4 You say using a configurable "modem shelf" was the
5 practical solution that the POSITA would have -- or
6 would implement, correct?

7 A This is my opinion. But, yes, if I were a
8 POSITA at the time and I knew -- I knew how base --
9 I did have some knowledge of how base stations were
10 made at that time because I worked at -- shortly
11 thereafter I worked at Texas Instruments and in the
12 same division that did the base station chips.

13 Q Okay. So you're saying that the hardware
14 configuration you would use and that you would
15 expect a POSA would use would be different than
16 what's disclosed in Atsuta, correct?

17 A That is what I state here.

18 Q And would using that different hardware
19 configuration still allow Atsuta to use the same
20 frame structure shown in the top half of Figure 3?

21 A No, that's not what I'm suggesting. A
22 POSITA would not use Atsuta at all. It would start

1 with Figure 1, which is what Atsuta describes as
2 prior art. Let me get back to that footnote 6.
3 Sorry, footnote 3.

4 What my footnote says is that a POSITA
5 would agree that combining the three indoor units of
6 Figure 1 into one enclosure would make sense. So
7 that means not -- don't use Atsuta's functionality
8 at all because it's wasteful of spectrum and a
9 number of other things.

10 You just take Atsuta's Figure 1, which is
11 the prior art, and so -- where is Atsuta's Figure 1?
12 Yeah, what you would do is simply take Figure 1 and
13 put 1A, 1B and 1C into the same box and give them
14 the same power supply, then you would save the
15 space, you wouldn't waste spectrum and -- you
16 wouldn't waste spectrum and capacity and you
17 would -- you would gain most, if not all, of the
18 useful benefits of any kind of a consolidation.
19 That's what that footnote 6 meant -- or that
20 footnote 3 meant.

21 Q Well, what I'm asking is in that version
22 that you're talking about, could a person of

1 ordinary skill still structure a frame as shown in
2 the top half of Figure 3 of Atsuta called the
3 present invention?

4 MS. SPIRES: Object to form.

5 A No, you would still be left with the
6 bottom half of Atsuta related art.

7 Q So you're saying a person of ordinary
8 skill couldn't structure a frame as shown on the top
9 half of Figure 3?

10 MS. SPIRES: Object to form.

11 A I think we're in circular hypotheticals
12 here. My footnote 6 basically says a person of
13 skill wouldn't use Atsuta at all.

14 Q Okay. All right. Looking at paragraph
15 126, I think you referred to this already, you
16 mention Atsuta's control circuit 9 having three
17 times as many outputs. What do you mean by that?

18 A It's handling -- let me get -- before I
19 answer, let me get to the statement. What paragraph
20 are you at?

21 Q 126.

22 A Right, the answer to your question is in

1 that same sentence, it has to handle three times as
2 many mobile stations, so it's going to have three
3 times as many outputs. Atsuta is pretty clear that
4 there's one output per allocated mobile station
5 slot.

6 Q But just to be clear, and let's look at
7 your comparison of Figures 1 and 2 in paragraph 122
8 of your declaration.

9 A Okay.

10 Q When you say the TDMA control circuit in
11 Figure 2 is going to handle three times as many
12 outputs, is that compared to any one TDMA control
13 circuit in Figure 1?

14 A Yes.

15 Q But it handles the same number of outputs
16 as the combination of all three TDMA control
17 circuits in Figure 1?

18 A You could look at it that way.

19 Q Okay. All right. Looking at paragraph
20 120 -- actually, you know what, before we do that,
21 we have been going about an hour. Why don't we take
22 a break.

1 (Recess 5:30 p.m. - 5:39 p.m.)

2 BY MR. OLIVER:

3 Q Dr. Chrissan, can you look at paragraph
4 127 of your declaration.

5 A Yes, I'm there.

6 Q And in that paragraph you refer to triple
7 frequency bandwidths shown in Figure 3 of Atsuta,
8 correct?

9 A Yes.

10 Q And the triple frequency bandwidths, are
11 they the extensions on either side of F1, F2 and F3
12 as shown on the bottom portion of Figure 3 relative
13 to the top portion?

14 A That is the best depiction in a diagram in
15 Atsuta. Atsuta also discusses it in Atsuta's text.

16 Q Looking at Atsuta's text in column 5, line
17 43, let me know when you're there.

18 A Did you say -- which column line 43?

19 Q Column 5, line 43.

20 A Yes, I am reading it.

21 Q And it indicates that the center
22 frequencies for both the invention of Atsuta and the

1 conventional frames are the same, correct?

2 A That -- that's what's indicated as well in
3 that diagram or that Figure 3 that we just looked
4 at.

5 Q And what that means is that the center
6 frequencies for F1 in both the top and bottom
7 versions are the same for each of F1, F2 and F3,
8 correct?

9 A Yes, that's correct, they don't -- Atsuta
10 doesn't shift them around. Those projections -- in
11 those projections that you talk about the center
12 frequencies are still the same. It's just the
13 bandwidth, the width of the object, I guess it's
14 kind of a square with shaved-off corners.

15 Q And so that would mean that the band --
16 frequency bandwidth from F1 to F3 is the same in the
17 top and bottom depictions, correct?

18 A I don't agree with that. But could you
19 clarify your question?

20 Q Well, if F1 in the top version and F2 in
21 the -- excuse me. F1 in the top version and F1 in
22 the bottom version have the same center frequency,

1 correct?

2 A Yes.

3 Q And F3 in the top and F3 in the bottom
4 have the same center wavelength frequency, correct?

5 A Yes.

6 Q That means that the center wavelengths for
7 F1 and F3 on both the top and bottom are the same,
8 correct?

9 A Your question is convoluted and covers
10 more than one concept.

11 Are you talking about the difference in --
12 are you saying the difference in the center
13 frequency between F1 and F3 does not change in
14 Atsuta's invention, I can agree with that. But if
15 we start talking about bandwidths or anything like
16 that, yeah, that -- those change and we have to
17 assess in particular what's going on.

18 Q So you agree that the difference between
19 F1 and F3 on the top and bottom are the same?

20 A Yes, according to Atsuta, the center
21 frequencies do not change.

22 Q Okay. So it seems to be your opinion that

1 the additional bandwidth that would need to be
2 obtained is bandwidth that exists between F1 and F2
3 and F3 -- F2 and F3 for the most part.

4 MS. SPIRES: Object to form.

5 A I don't know what you mean by exists.
6 It's completely unknown. It's unknown what the
7 frequencies -- what the frequency bands are between
8 F1, F2 and F3.

9 Q Is it possible that they're close together
10 and that the system already has the entire bandwidth
11 from F1 to F3?

12 MS. SPIRES: Object to form.

13 A Again, I -- you would have to present me
14 with a particular situation. And even then, you're
15 still taking up extra bandwidth on the ends.

16 Q Okay. Taking -- putting aside the ends
17 for right now, if a carrier, meaning like a
18 provider, already owned all of the bandwidth shown
19 in the bottom part of Figure 3, and then in the top
20 part of Figure 3 that carrier would just be
21 utilizing more of the bandwidth it already has
22 licensed, correct?

1 A In the scenario that you describe, that
2 could be the case.

3 Q Do you know if -- never mind.

4 Can you look at Atsuta column 4, lines 13
5 through 17. Are you there?

6 A I'm reading it. Yes, I see that.

7 Q What's the -- what's your understanding of
8 what transmission capacity is?

9 A Within the context of transmission
10 capacity of the base station, which is the whole --
11 the totality of that term, I would say it's the
12 total capacity in this -- in this case it would be
13 the total capacity that the base station is able to
14 receive.

15 Q And is that in terms of frequency
16 bandwidth?

17 MS. SPIRES: Object to form.

18 A Let me -- it's not in terms of frequency
19 bandwidth. We had a discussion earlier about
20 bandwidth versus capacity. I think Atsuta is
21 referring to data capacity. In one instance Atsuta
22 uses the term "data capacity."

1 Q Well, can data capacity be achieved in
2 either terms of time or frequency bandwidth?

3 A I don't agree with your question as stated
4 word by word, but in general concept I would agree
5 with that.

6 Q Okay. And just to be clear about what you
7 agree with, is it that data capacity can be
8 increased by increasing frequency bandwidth?

9 A Without -- without regard to any
10 particular opinion or interpretation, but speaking
11 from a person of skill in the communication arena,
12 that is a true statement. That is fundamental.

13 Q Can you look at paragraph 128 of your
14 declaration.

15 A Yes. Let me get there. You said 128?

16 Q Yes. And specifically at the top of page
17 64, the second full sentence.

18 A "In my opinion"?

19 Q Yes.

20 A "In my opinion" -- yeah, let me read it.
21 I think we discussed this. "In view of my own modem
22 hardware design experience in 1996, Atsuta's design

1 would have provided little to no benefit of reduced
2 power or hardware complexity relative to the added
3 costs of its implementation, let alone the costs of
4 securing additional frequency spectrum," or using,
5 just using the additional spectrum as an opportunity
6 cost that could have been used somewhere else.

7 Q Why are you using 1996 as the date?

8 A The reason I put 1996 is because that's
9 when Atsuta was filed. But the same -- the same
10 opinion would apply at the time of the '931 patent
11 as well.

12 Q And when we talk about costs of, for
13 instance, TDMA control circuit, are you saying that
14 the more robust TDMA control circuit used in the
15 invention of Atsuta would be more expensive than any
16 one of the three prior art TDMA circuits that it was
17 replacing?

18 A Yes. Well, could you restate your
19 question?

20 Q Sure. You're talking about the costs of,
21 for instance, implementation which would be getting
22 a more robust TDMA control circuit that could handle

1 everything that the three prior TDMA control
2 circuits handled, correct?

3 A Right. So let's -- are you saying forget
4 about the rest of Atsuta's invention and focus only
5 on the TDMA control circuit?

6 Q Yeah, as an example of one circuitry, yes.

7 A Okay.

8 Q So are you saying the combined TDMA
9 control circuit 9 in Atsuta would be more expensive
10 than any one of the prior TDMA control circuits of
11 the prior art discussed in Atsuta?

12 A Yes, that's correct. Possibly almost
13 three times as complex, although I did not do that
14 analysis. It probably wouldn't be three times as
15 complex, just probably be somewhere between two and
16 two and a half times as complex as any one of them.

17 Q Okay. If you could turn to paragraph 129
18 of your declaration. And there you talk about the
19 clock rates, correct?

20 A 129. Okay. I'm there.

21 Q Okay. And you refer to higher clock
22 rates, correct?

1 A Yes, I do.

2 Q And why would Atsuta's design require
3 higher clock rates?

4 A Because it requires higher bit rates which
5 translate back to those wider bandwidths. See, what
6 happens is -- we can compare Figure 1 and 2 again.
7 Where is it? Okay.

8 Well, let's start at Figure 3, which is
9 reproduced in my paragraph 127. So you can see that
10 comparing -- well, you can see that each time
11 slot -- look at the present invention and then look
12 at the related art. It's pretty easy to see that
13 whatever Atsuta is calling a time slot is one-third
14 as long in time in the upper diagram as it is in the
15 lower diagrams. Do you see what I mean?

16 Q Yes.

17 A Okay. So if a lower slot is one
18 millisecond -- let's say the lower slot is 3
19 milliseconds, and an upper slot is 1 millisecond,
20 that instantly converts into all of your digital
21 logic running three times faster. If your slots --
22 if you cut your slot time by half, your logic is

1 going to run twice as fast. If you cut your slot
2 time by three, you're going to -- you're going to
3 need to run your digital logic at three times the
4 rate. And also if you cut your slot time by three,
5 that instantly translates to the wider bandwidth.

6 So, anyway, I'll stop there. But when I
7 first looked at Atsuta, I asked how does it -- you
8 know, how does it not sacrifice data rate by doing
9 this. And then I realized that, you know, that
10 Atsuta's -- Atsuta's solution for not sacrificing
11 data rate is to triple the -- triple the bandwidth.

12 Q Just on the time aspect, though, with
13 respect to the clock, looking at Figure 3, the
14 bottom ones are the time is 20 TS. What does that
15 refer to?

16 A No, that's just the number -- well, 20 TS
17 is 20 time slots. So that's another way of saying
18 the same thing. You can see that the upper diagram
19 has 60 time slots in the same greater span of time
20 represented by the dotted vertical lines. The
21 dotted vertical lines have 60 TS in the upper
22 diagram and 20 TS, time slots, between them in the

1 lower diagram. That's just another way of depicting
2 and reinforcing that the time slots in the upper
3 diagram are one-third the time, one-third the
4 duration of time as the time slots in the lower
5 diagram.

6 Q So you're assuming that the top and bottom
7 diagrams have the same total time?

8 A I don't have to assume that. It's -- I'm
9 looking at it. I mean, Atsuta is not playing tricks
10 on us. Those vertical dashed lines are meant to
11 mean the same times in the upper and lower diagrams.

12 Q But there's no indication of a time axis,
13 is there?

14 A I don't think any person of skill would
15 dispute that the diagrams on the left are time and
16 the diagrams on the right are frequency.

17 Q Do time slots have to be a certain time
18 wide, or of a certain duration maybe is the better
19 way to put it?

20 MS. SPIRES: Object to form.

21 A We talked about this earlier, and I think
22 you said how does a person of skill design a system.

1 You start from the business requirements, and you
2 could end up with a wide variety of systems that
3 have different -- that have different slot lengths.

4 But I also said, you know, in some cases
5 you choose to design your system to a protocol or an
6 industry known standard, and in that case, there may
7 be some predefined constraints.

8 Q And those predefined constraints might
9 dictate how long each time slot is?

10 A Yes. Even in the 1990s I believe the GSM
11 standard existed and it defined -- it defined time
12 slots.

13 Q Looking at Figure 1 of Atsuta, this is the
14 prior art, and there are three different indoor
15 units, correct, on the bottom?

16 A There are three different what units on
17 the bottom?

18 Q They are just labeled on the bottom --

19 A Oh, indoor, indoor units, yes, there are
20 three different indoor units on the bottom.

21 Q And would each one of those have its own
22 clock?

1 A I want to read through Atsuta. I believe
2 it says that the indoor units of the prior art each
3 has its own housing.

4 Atsuta doesn't mention the word "clock."
5 Certainly it's inherent that an indoor unit has at
6 least one clock. But the design of -- exactly the
7 design of the clocks and clock distribution is not
8 covered in Atsuta.

9 Q So would it be fair to say that a person
10 of ordinary skill in the art would expect that each
11 first indoor unit has at least one clock?

12 A I think a person of skill would interpret
13 that, yes.

14 Q And looking at Figure 2, there is a single
15 indoor unit, correct?

16 A That is how Atsuta logically draws it,
17 yes.

18 Q And would the same idea apply that a
19 person of ordinary skill would assume that there's
20 at least one clock in the indoor unit of Figure 2?

21 A Yes. It may not be the same clock as the
22 other one, but there's at least one clock. And in

1 fact, each -- each frequency converter is going to
2 have a clock as well. So, but there's no point
3 getting into the design details. In fact, I think
4 that frequency control circuit 11 is probably meant
5 to be a clock generator.

6 Q Okay. Can you look at paragraph 109 of
7 your declaration. Let me know when you're there.

8 A I'm there.

9 Q In the third sentence you state, "For
10 these reasons, a person of ordinary skill would not
11 understand that any given TDMA frame that might be
12 implied or described by Atsuta is 'compatible with a
13 TDD frame.'"

14 Do you see that?

15 A Yes.

16 Q And what do you mean by "any given TDMA
17 frame"?

18 A The full answer to that is addressed in a
19 number of places throughout my declaration. Let me
20 go back to the start of my description of Atsuta.
21 So that I remember, what was the paragraph number
22 that we started at?

1 Q 109.

2 A I wrote that on a sticky note.

3 Okay. Which portion of that statement --
4 so we were talking about the statement, "For these
5 reasons, a person of skill would not understand that
6 any given TDMA frame that might be implied or
7 described by Atsuta is 'compatible with the TDD
8 frame.'"

9 What was your specific question about that
10 statement?

11 Q What do you mean by any given TDMA frame?

12 A Well, the phrase is "any TDMA frame that
13 might be implied or described." And the reason I
14 say that is I described elsewhere in my declaration,
15 such as paragraphs 84 and 98, that Atsuta does not
16 provide a complete description of its system. There
17 are things that would leave a person of skill in
18 need of doing experimentation, in some cases undue.

19 So let me see here. Okay. In paragraph
20 84 I say, "Downlink operation is only described
21 minimally in Figure 4 and its associated text at
22 column 6, lines 24 to 57." So especially in the

1 downlink.

2 And then at paragraph 98 I talk about the
3 added bits. Atsuta has added bits in Figure 3. I
4 have -- regarding the added bits in Figure 3, I have
5 a paragraph 98 that -- that provides a response to
6 Dr. Almeroth's discussion of those added bits.

7 So to make a long story short, if you read
8 through all of the Atsuta sections of my
9 declaration, I state that it's a person of skill
10 looking at Atsuta would still have questions and
11 have things that would need to be figured out.

12 So I wanted to cover the possibility of a
13 TDMA frame that might be similar to Atsuta in
14 concept, but slightly different because the added
15 bits were, you know, some experimentation was done
16 to vary it a little bit. So that's why I put in the
17 word "implied."

18 But I think otherwise, I've -- let me see.
19 "For these reasons, a person of skill would not
20 understand that any" -- so I think the way I wrote
21 that it would be equivalent -- it would be
22 equivalent simply to say a person of skill would not

1 understand that a TDMA frame that might be implied
2 or described by Atsuta is compatible. So any given
3 could be replaced with the word.

4 Does that clarify it?

5 Q No, not at all.

6 But let's ask this. TDMA and TDD are
7 compatible, correct?

8 MS. SPIRES: Object to form.

9 A We answered that already. They can be
10 used together.

11 Q So what would prevent, separate and apart
12 from Atsuta, what would prevent any given TDMA frame
13 from not being compatible with a TDD frame?

14 MS. SPIRES: Object to form.

15 A We have discussed this already, at least
16 when we talked about the no motivation to combine
17 with respect to Atsuta.

18 If a TDMA frame is already employed in an
19 existing system that is designed for FDD, and you
20 would have to completely rip that system up and
21 start over to change it to TDD, which is typically
22 the case, they are that different, then the TDMA

1 frame of that given FDMA system is not compatible
2 with TDD. That's -- they are that fundamentally
3 different.

4 Q What if you started with a TDD system,
5 would a person of ordinary skill understand that
6 TDMA functionality could be incorporated into a TDD
7 system?

8 MS. SPIRES: Object to form.

9 A Could you ask your question again?

10 Q What if someone started with a TDD
11 system --

12 A Yes.

13 Q -- would a person of ordinary skill
14 understand that TDMA methodology could be
15 incorporated into a TDD system?

16 A I would put it a little differently. I
17 would say a person of skill would understand that
18 that TDD system may well also incorporate TDMA.
19 That's a natural consequence of the extrinsic
20 documents that we've been looking at. The Rappaport
21 diagram, it basically says there are existing
22 systems that use TDMA and FDD. There are existing

1 systems that use TDMA and TDD.

2 Q Just so we're clear, turn to Atsuta Figure
3 3. I want to make sure we're on the same page. And
4 on the bottom number 2 version, there are three
5 different TDMA frames for three different sector
6 zones, correct?

7 A Okay. So we're looking at Atsuta Figure
8 3, right?

9 Q Correct.

10 A Atsuta labels those as sector zone 1,
11 sector zone 2, and sector zone 3. So I think the
12 answer to your question is yes.

13 What was your question again?

14 Q Whether or not the bottom half labeled as
15 2 in Figure 3 shows three different TDMA frames each
16 for a different sector zone.

17 A Yes, that's what it shows.

18 Q And on the top labeled as the present
19 invention, what Atsuta is describing it's doing is
20 combining into one frame the communications to those
21 three different sector zones, correct?

22 A I would say that is true, although

1 interestingly, after that combination, the sector
2 zones still use different frequencies. So that
3 arguably is something other than TDMA at that point
4 given certain definitions of TDMA. But that's --
5 but they are combined somehow.

6 Q And the three different zones are
7 separated into different slots of time, correct?

8 MS. SPIRES: Object to form.

9 A Let me see how Atsuta describes that. I
10 can't find that, that Atsuta describes exactly the
11 relationship between the lower and the upper parts
12 of Figure 3.

13 What was your question again?

14 Q Well, it appears from the disclosure of
15 Atsuta and Figure 3, that the transmissions to the
16 three different sector zones 1, 2 and 3 in the
17 bottom are separated into different time slots in
18 the top, which are labeled 1, 2 and 3. Is that your
19 understanding?

20 A Well, this is reception, right, so
21 these -- so we're talking about received time slots,
22 so.

1 But ask the question again. I'll try to
2 take the rest of the question as you stated it.

3 Q Are the three different sectors from the
4 bottom spaced out in time different time slots in
5 the combined top version?

6 MS. SPIRES: Object to form.

7 A I don't know exactly what you mean, so I
8 can't answer the question yes or no.

9 Q What are the three different labeled
10 sections of time 1, 2 and 3 in the top figure?

11 A Let me look at the description of Figure 3
12 again.

13 Q Let me just, before you do that, did you
14 not consider this in advance of writing your
15 declaration?

16 MS. SPIRES: Object to form.

17 A When you say consider "this," what do you
18 mean? I considered what Atsuta writes.

19 Q Did you consider whether 1, 2 and 3
20 labeled as the different 20 time slot intervals on
21 the top correspond to the different sector zones 1,
22 2 and 3 on the bottom?

1 A I did consider how the top and the bottom
2 are related, and I read Atsuta, and I want to read
3 it again.

4 Q But just to answer my question, did you
5 consider, before writing your declaration, whether
6 the three labeled 20 second time slots 1, 2 and 3 in
7 the top correspond to the different sector zones 1,
8 2 and 3 on the bottom, or is this an analysis you're
9 doing for the first time now?

10 MS. SPIRES: Object to form.

11 A I did consider that.

12 Q And what conclusion did you draw?

13 We're sitting here in silence again. Do
14 you need me to repeat the question?

15 A No, I understand the question. I'll need
16 to look through Atsuta and my declaration.

17 Atsuta is somewhat confusing in that it
18 describes it in different ways. But my opinion is
19 it's possible, that is a possible interpretation.

20 Q All right. Can you turn to column 6 of
21 Atsuta. And I believe you acknowledged in your
22 declaration that column 6, lines 25 through 57

1 describe downlink transmission, correct?

2 A I believe I did.

3 Q And if you look at line 35, please.

4 A Yes.

5 Q 35 states, "In addition, the TDMA control
6 circuit 9 shown in Figure 4 receives a plurality of
7 modulated signals to be transmitted to the
8 subscriber stations, arranges these signals into one
9 signal sequence as a predetermined synchronous frame
10 in the TDMA method, and outputs the resultant signal
11 sequence to modulating circuit 12."

12 Do you see that?

13 A Yes.

14 Q So that's talking about downlink, correct?

15 A Yes, it is.

16 Q And it refers to putting the different
17 signals for the different subscriber stations in a
18 predetermined synchronous frame, correct?

19 A That is what it literally states.

20 Q And you would understand a frame to be a
21 single frame, correct?

22 A As Atsuta describes it, a frame is

1 singular, not plural.

2 Q Okay. One last question on Atsuta, I
3 think, although I can't promise that.

4 Can you look at just Figure 3 of Atsuta.

5 A Yes.

6 Q Is there anything in Figure 3 that states
7 whether this is for uplink or downlink, or both?

8 A Figure 3 itself literally does not use the
9 words "uplink" or "downlink" or both.

10 Q All right. Looking at the top of Figure
11 3, for the portion labeled the present invention,
12 that shows a single synchronous frame, correct?

13 A Atsuta labels it as such.

14 MR. OLIVER: Okay. Why don't we take a
15 break now before turning to Goldberg. Let's go off
16 the record.

17 (Recess 6:31 p.m. - 6:39 p.m.)

18 BY MR. OLIVER:

19 Q Can you turn to the Goldberg reference,
20 please, specifically --

21 A Yes.

22 Q -- column 2, line 6.

1 A Is it okay if I close on the Vornefeld and
2 Atsuta?

3 Q Yes.

4 A Okay. And you said which column?

5 Q Column 2 starting at line 6.

6 A Yes, I'm there. I'm reading it.

7 Q And the sentence there states, "The
8 present invention is applicable to all downlink
9 broadcasts and transmissions," correct?

10 A Yes. My pause is I want to clarify that
11 when it says that, I think it's primarily referring
12 to the invention as described in the abstract.

13 But, yes, it does say the present
14 invention is applicable to all downlink broadcasts
15 and transmissions.

16 Q What do you mean the invention as
17 described in the abstract?

18 A That's in my declaration, so we can go
19 there. My discussion of Goldberg starts on 135, and
20 in paragraph 136 I put -- I reproduce a portion of
21 the abstract where I say, "This invention relates to
22 a method and apparatus for transmitting one or more

1 downlink signals simultaneously over the same
2 conventional channel from a communication station to
3 one or more subscriber units to achieve a desired
4 overall radiation pattern (e.g., a near
5 omnidirectional pattern) over a desired sector..."

6 So that's -- and then at the top at my
7 paragraph 136, I state, "Goldburg is directed to
8 beamforming within a single sector, and teaches
9 methods by which advanced antenna arrays with
10 multiple antenna elements can 'achieve a near
11 omnidirectional pattern throughout its area of
12 coverage.'"

13 So if we go back to Goldburg's column 2,
14 line 6, all I'm qualifying or emphasizing is that
15 when Goldburg says "the present invention," and I
16 think Goldburg is mainly referring to what we just
17 discussed and what Goldburg states in its abstract
18 and, of course, in its claims.

19 Q Can you look at column 1 starting at line
20 48.

21 A Yes.

22 Q And there it states, "Some examples of a

1 cellular system to which the present invention can
2 be applied are systems using variants of," and then
3 it goes on to list a number of different options,
4 correct?

5 A Yes, it does.

6 Q And one of those is GSM, correct?

7 A Yes, it is.

8 Q And another one is Personal Handy Phone
9 System, which is referred to as PHS, correct?

10 A It does mention that, yes.

11 Q And do you know what methods for uplink
12 and downlink a PHS system uses?

13 A So let me -- okay. So off the top of my
14 head, no.

15 But let me qualify that 48 says, line 48
16 says, "Some examples of a cellular system to which
17 the present invention can be applied are systems
18 'using variants' of the..." So that doesn't mean
19 you can take those systems as is and apply Goldburg.
20 It means you have to vary them.

21 Q Do you know if the PHS system is TDMA or
22 FDMA?

1 A Not off the top of my head.

2 Q Do you know if the PHS system is TDD or
3 FDD?

4 A Not off the top of my head.

5 Q And did you look into PHS before or during
6 the drafting of your declaration?

7 A I don't believe I did.

8 Q Looking at column 2, line -- starting at
9 line 25, let me know when you're there.

10 A I'm there.

11 Q It states there, "Using such an antenna
12 array, spacial division multiple access (SDMA)
13 techniques also are possible."

14 Do you see that?

15 A Yes, I see that.

16 Q So that seems to indicate that Goldberg's
17 design can be used with SDMA, correct?

18 A Could you repeat your question?

19 Q My question is just that Goldberg
20 indicates there that its system can be used with
21 SDMA techniques, correct?

22 A Yes, if you look at column 9, line 34, it

1 says, "The invention preferably is implemented as
2 part of a wireless communication system with SDMA."

3 Q And that same section of column 2 goes on
4 to give other examples that can be concurrently
5 used, including TDMA, correct?

6 A Let me go back to column 2. In fact, let
7 me start at the beginning of that paragraph. I'm
8 going to start at column 2, line 12.

9 Okay. What's your question again?

10 Q That Goldberg seems to indicate that its
11 system can be used with both SDMA and TDMA. Is that
12 a fair assessment?

13 A I think that's a fair assessment.

14 Q Can you turn to paragraph 146 of your
15 declaration. And in the second sentence you note
16 that the petitioner argues that Goldberg discloses
17 using one frame for multiple downlink transmissions.

18 A Okay. I read my paragraph 146.

19 Q And it states that the petitioner takes
20 the position that Goldberg discloses using one frame
21 for multiple downlink transmissions, correct?

22 A That's what that statement says. Did you

1 include the petition in the exhibits? Yeah, you
2 did. Let me take a look.

3 Q I'm not questioning whether or not the
4 petition says that, so you don't need to open up the
5 petition right yet. Let me get to my actual
6 question.

7 You further state that "Claims 28 and 29
8 require more," correct?

9 A Yes, the declaration says "Claims 28 and
10 29 require more," and then it goes on to state what
11 they expressly require.

12 Q I didn't see in this paragraph or
13 elsewhere where you dispute that Goldberg discloses
14 using one frame for multiple downlink transmissions.
15 Did I miss something?

16 A I do need to look at the petition. I have
17 it open.

18 Q Just to be clear, my question is just
19 whether or not anywhere in your declaration you
20 dispute the sentence including in -- sentence in
21 paragraph 146 about Goldberg disclosing -- using one
22 frame for multiple download transmissions. Do you

1 understand that?

2 A I understand that. But for me to give a
3 complete answer, I do need to refer to anything
4 that's referenced.

5 The petition references Goldberg at column
6 3, line 47, and column 9, line 59. Let me review
7 that next.

8 Q And again, you recall that my question is
9 just about whether or not anywhere in your
10 declaration you disagree with the idea stated in
11 paragraph 146 of your declaration.

12 A Yes, I understand your question and I'll
13 get you the answer.

14 Sorry. I wanted to write down the ending
15 part of Goldberg, too. So it's column 3, 47 to
16 column 4, 18.

17 Okay. I cannot find in my declaration
18 that I agree with or refute the using one frame.

19 Q Having reviewed Goldberg in drafting your
20 declaration and preparing for this deposition, do
21 you have any basis to refute that statement?

22 MS. SPIRES: Object to form.

1 A Could you repeat your question?

2 Q Yeah. Having reviewed Goldberg in
3 drafting your declaration and preparing for this
4 deposition, do you have any basis to dispute that
5 Goldburg describes transmitting to different devices
6 within the same frame?

7 A My opinions on Goldberg are in my
8 declaration. I'll recite paragraph 138.
9 "Furthermore, Goldberg does not" -- starting over.

10 "Furthermore, Goldberg does not in any way
11 address how transmissions should be organized in a
12 TDD network. No TDD frames or even basic TDD frame
13 structures are shown in Goldberg. The terms 'TDD'
14 and 'time division duplexing' are not even used in
15 Goldburg. In fact, Goldberg only discusses the
16 opposite, FDD, and all embodiments of the invention
17 disclosed in Goldberg use the GSM standard (which is
18 an FDD technology.)"

19 So I believe that, at minimum, that
20 refutes or at least puts forth an opinion that
21 Goldburg certainly does not teach a TDD frame.

22 Q What did that have to do with my question?

1 MS. SPIRES: Object to form.

2 Q And let me be clear, I was asking about
3 transmissions to different devices. That's an issue
4 of multiple access, correct?

5 MS. SPIRES: Object to form.

6 A You asked me about my opinions on
7 Goldberg. I'm giving you my opinions on Goldberg,
8 so, and then when I'm done, I'll, you know, if -- if
9 I do not address the -- sorry, we started at
10 paragraph 109?

11 Q I asked you about transmission to
12 different devices within the same frame, which is a
13 multiple access issue, correct?

14 MS. SPIRES: Object to form.

15 Q Let me back up. Do you understand the
16 difference between what TDMA does versus what TDD
17 does?

18 MS. SPIRES: Object to form.

19 A Yes. We've discussed that many times.

20 I'm focusing on your question of -- which
21 I believe is have I addressed this statement in the
22 petition about Goldberg discloses using one frame.

1 Is that a true assessment of your question?

2 Q One frame for communications to different
3 devices. And just so we're on the same page, you
4 agree that that would require analysis of the TDMA
5 part of the system rather than the TDD part of the
6 system, correct?

7 A I would have to think about that question
8 before I answered it. I'm going back to the
9 petition. Before I can give you an answer as to
10 whether or not I have addressed something, I do need
11 to review everything I wrote.

12 Q But you're currently reading the petition,
13 correct?

14 A No. I switched to my declaration.

15 Yeah, I don't agree that I -- scratch
16 that. That was a double negative.

17 I believe that I address that statement
18 with my other paragraphs at least in part. I read
19 you part of another -- I read you part of a
20 paragraph. At 140 I say, "Petitioner's expert
21 states 'Goldburg describes sending downlink signals
22 from a base station to users in different regions

1 within a single TDD frame,'" and then I refute that.
2 I refute "sector."

3 So to answer your question and close this
4 out, maybe I don't literally address that one quote
5 in the petition, but I do believe that my arguments
6 individually and as a whole in sections G -- I think
7 7G and thereafter do address -- do address that
8 assertion.

9 Q What assertion?

10 A That -- let's see. So the assertion that
11 Goldberg discloses using one frame for multiple
12 downlink transmissions, what I -- what I describe is
13 it's not one TDD frame and it's not different
14 sectors.

15 Q All right. Let's take a step back. You
16 keep going to TDD and I'm not asking about TDD.

17 If there is a question of multiple access,
18 meaning communications to different devices, that is
19 covered by Goldberg's TDMA methodology, correct?

20 A Goldberg does encompass TDMA and that
21 is -- that does support multiple access. We've
22 discussed that many times.

1 Q Do you dispute that Goldberg discloses
2 communicating in a TDMA method to different
3 subscribers in the same frame?

4 MS. SPIRES: Object to form.

5 A Yeah, again, I would need to go through
6 and analyze Goldberg. I believe that my opinions
7 are -- my opinions are what I -- what I put in my
8 declaration are my opinions and that's all of my
9 opinions. Goldberg does not disclose a TDD frame
10 and Goldberg does not disclose a plurality of
11 sectors. I would need -- you know, just a generic
12 frame, I would want to reanalyze Goldberg from
13 scratch.

14 Q Well, let me direct you to a specific part
15 of Goldberg, column 12, starting at line 11 through
16 line 24.

17 A Column 11, you said line?

18 Q 11 through 24.

19 A Okay.

20 Q And it refers to a frame there in the
21 first sentence, correct?

22 A So you're at what line in column 11?

1 Q Sorry. Column 12, line 11.

2 A Okay. So it does talk about a GSM
3 downlink frame.

4 Q And within that frame there are different
5 time slots assigned to different mobile devices,
6 correct?

7 A It does describe that.

8 Q And it doesn't limit that to the mobile
9 devices being in any particular sector, does it?

10 MS. SPIRES: Object to form.

11 A If you refer to paragraph 136 of my
12 declaration, I say, "Goldburg is directed to
13 beamforming within a single sector, and teaches
14 methods by which advanced antenna arrays with
15 multiple antenna elements can 'achieve a near
16 omnidirectional pattern throughout its area of
17 coverage.'"

18 A A person of -- I and a person of skill
19 reading Goldburg understands that Goldburg is
20 directed to beamforming within a single sector.

21 Q Beamforming within a single sector refers
22 to simultaneous transmissions, correct?

1 A We've established that it can.

2 Q And as we've already established, Goldberg
3 is directed to both SDMA and TDMA techniques,
4 correct?

5 A Yes, we have established that.

6 Q And beamforming is typically part of the
7 SDMA technique, correct?

8 A Those two are associated.

9 Q So directing you back to column 12, line
10 11 through 24, when it's talking about different
11 time slots for different users, that seems to be
12 indicating the TDMA aspect of Goldberg, correct?

13 MS. SPIRES: Object to form.

14 A I think a person of skill would generally
15 agree with that.

16 Q And in that context, the TDMA methodology
17 where different subscribers are assigned to
18 different time slots is not described in that
19 section as being limited to any particular sector,
20 correct?

21 A As I mentioned in my declaration, taking
22 Goldberg as a whole, it's clear that it's directed

1 to beamforming within a single sector. So if it's
2 describing any portion of its invention anywhere,
3 then that description is within a single sector.

4 Q But, again, you've gone back to
5 beamforming, and we've agreed that Goldberg
6 discusses both beamforming in SDMA and TDMA,
7 correct?

8 MS. SPIRES: Object to form.

9 A Can you repeat that?

10 Q Do you need me to repeat the question?

11 A Yeah, I do.

12 Q You keep going back to beamforming, but
13 beamforming is typically used for SDMA, correct?

14 A Yes.

15 Q And typically when using beamforming in
16 SDMA, there are simultaneous transmissions.

17 A There can be.

18 Q And Goldberg also describes TDMA, correct?

19 A Yes.

20 Q And you agree that in column 12, lines 11
21 through 24, it appears to be referring to a TDMA
22 methodology, correct?

1 MS. SPIRES: Object to form.

2 A I think that paragraph 11 to 24 in
3 isolation is -- is a TDMA-focused description.

4 Q And within that TDMA description, that is
5 not limited to any particular sector, is it?

6 MS. SPIRES: Object to form.

7 A That's where I think we have a disconnect.
8 If the SDMA portion is limited to a sector, the TDMA
9 portion is limited to a sector as well. They go
10 hand in hand.

11 So, yeah, Goldberg overall -- I think
12 that's where we had a disconnect, Goldberg overall,
13 whether it's talking about its TDMA aspect or its
14 SDMA aspect, is only focused on a single sector.

15 Q Let me ask this. Would a person of
16 ordinary skill in the art understand that a TDMA
17 methodology could provide time slots to be used
18 across sectors?

19 MS. SPIRES: Object to form.

20 A Give me that question again.

21 Q Would a person of ordinary skill
22 understand that a TDMA methodology could provide

1 time slots to be used across sectors?

2 MS. SPIRES: Object to form.

3 A That is -- that is not a common
4 understanding.

5 Q Isn't that what Atsuta does?

6 A I was about to say Atsuta is an odd
7 reference, and as I mentioned before, Atsuta uses
8 different frequencies in its sector and then
9 combines them. So it's arguably not even TDMA
10 anymore.

11 But to answer your question, Atsuta is an
12 odd one-off reference, and I have discussed that in
13 this deposition and in my declaration. I even said
14 point-blank a person of skill would not be inclined
15 to use it.

16 So I'll go back to my original answer to
17 you, that -- to your question is no, that a person
18 of skill, that's not something that they would
19 acknowledge as common.

20 Q Would a person of ordinary skill
21 understand that one could provide a frame where the
22 time slots were allocated to communications with

1 different devices across different sectors, or would
2 that be inherently problematic?

3 MS. SPIRES: Object to form.

4 A Yeah, that -- we're getting into aspects
5 that would require particular -- an analysis of a
6 particular system within a given particular time
7 frame. That's -- there's too many unknowns and
8 variables and it's too general. That would require
9 a separate analysis.

10 Q Well, what about Atsuta then makes it odd?

11 A Well, I think the number one -- well,
12 let's go back to my description of Atsuta. Atsuta
13 is mainly about sharing hardware.

14 Q And I'm not interested in the hardware.
15 I'm talking about the sector construct where there
16 are multiple transmissions spread along a time axis
17 to different sectors. What about that would a
18 person of ordinary skill in the art consider odd?

19 MS. SPIRES: Object to form.

20 A I'm sorry, what about?

21 Q Providing in a single frame communications
22 on different time slots to devices in different

1 sectors.

2 A That is not what a person of skill would
3 consider odd. It's other aspects of Atsuta that a
4 person of skill would consider odd, as I've
5 described extensively in this -- in my declaration
6 and in this deposition.

7 I believe, you know, by the time you get
8 to the claims of the '931, those were inventive.

9 Q So when you say that a person of ordinary
10 skill in the art would not consider the aspect of
11 Atsuta where different time slots in the same frame
12 are assigned to different devices in different
13 sectors would not be odd, why is that?

14 A I have no opinion. All I'm saying is
15 that's not the part of Atsuta that I consider odd.

16 Q So that frame structure is not odd to you?

17 MS. SPIRES: Object to form.

18 A Well, I would consider it strange, too,
19 given that -- given how wasteful it is.

20 Q Well, you just said it would not be
21 considered odd, but now you're saying it's strange.
22 I'm trying to understand what your opinion is.

1 MS. SPIRES: Object to form.

2 A Let's wind it back. I do believe that a
3 person of skill would consider Atsuta's Figure 3 odd
4 for the reasons that I described; it's wasteful of
5 frequency and it does not provide the benefits that
6 Atsuta claims. Those are my opinions in my
7 declaration.

8 Q But taking aside the frequency usage, I'm
9 just talking about the frame structure. Would a
10 person of ordinary skill in the art consider it odd
11 to have different time slots in one frame assigned
12 to different devices in different sectors?

13 A At the time of Atsuta? Again, we're
14 getting into too many hypotheticals. We would
15 need -- I can't do an analysis without a lot of
16 details about a particular system at a particular
17 time.

18 Q I'm not providing a hypothetical.
19 Atsuta actually describes, correct me if
20 I'm wrong, a frame that has different time slots
21 provided for devices in different sectors, correct?

22 A Yes. I believe that a person of skill

1 would consider Atsuta's invention and the resulting
2 frame structure as odd.

3 Q But what about the frame structure alone?

4 MS. SPIRES: Object to form.

5 A That -- I can only read from my
6 declaration.

7 Q That sounds right.

8 All right. Let me change gears.

9 A I do give my opinions on Atsuta and they
10 contain the totality of my opinions on, you know,
11 why I think Atsuta has problems and issues, in
12 addition to a couple of things I've mentioned on the
13 transcript here.

14 Q Can you look at paragraph 149 of your
15 declaration.

16 A I'm there.

17 Q So you talk about the District Court's
18 claim construction for sector, correct?

19 A Yes, I do.

20 Q And then you conclude that paragraph
21 stating, "In light of these facts, a person of skill
22 would not have been motivated to combine Goldberg

1 with Vornefeld," correct?

2 A Yes. Let me read paragraph 149.

3 Again, as we -- similar to the last topic
4 like this, my purpose of 149 is to provide an
5 opinion in response to petitioner and petitioner's
6 expert.

7 Q I just want to understand what connection
8 you're drawing between the claim construction
9 adopted by the District Court and the motivation to
10 combine Goldberg with Vornefeld.

11 MS. SPIRES: Object to form.

12 Q And specifically how does one affect the
13 other, if at all.

14 A Okay. For that we should look at Figure 3
15 of Vornefeld. So I'm writing down that we started
16 at paragraph 149. I'm in my declaration now
17 searching for the Court's claim construction.

18 Q And just to be clear, I'm just trying to
19 understand how you draw a connection between any
20 claim construction and motivation to combine
21 references.

22 A Okay. Let's start with the Court's

1 construction of sector, that's on page 30 of my
2 declaration. The court specifically noted, "As a
3 further clarification, a 'sector' cannot be the area
4 covered by any one directed scanning beam."

5 This was a clarification made by the Court
6 in light of which clarifies a topic, because earlier
7 before this -- before this claim construction order,
8 there was a proposed construction of sector by
9 patent owner whereby one directed scanning beam
10 would satisfy a sector.

11 So now let's go to Vornefeld's Figure 3.
12 So what that means is that under the Court's
13 construction, figure -- you can't say there's --
14 it's not -- an interpretation is not supported such
15 that different devices getting different directed
16 spacial beams count as different sectors.

17 So now let's go back to where we started,
18 my declaration at 149. Okay. So 149 starts with an
19 assertion by the petitioner that a person of skill
20 would combine Goldberg with Vornefeld, and the
21 petitioner gives an assertion that one of the --
22 some factor in the motivation to combine is that

1 "Vornefeld recognizes that certain sets of
2 subscribers are not suited for concurrent
3 transmission due to signal interference
4 constraints."

5 But, again, that relies on a construction
6 of sector that no longer applies and, therefore, the
7 assertion that Vornefeld recognizes the sets of
8 subscribers are not suited for concurrent
9 transmission. Let's see. Sector...

10 Q You seem to be staring at something
11 quietly. Are you looking at a particular paragraph?

12 A I'm looking at paragraph 149 again.
13 Could you repeat your question?

14 Q I'm just trying to understand what you
15 believe to be the connection between the Court's
16 claim construction and the motivation to combine
17 Vornefeld and Goldberg.

18 You seem to be sitting there quietly
19 again. Are you still looking at paragraph 49?

20 A 149.

21 Q Do you need me to rephrase the question
22 for you?

1 A Not yet. I'm also looking at the
2 petition.

3 Q You still seem to be struggling for this,
4 so let me break it down into two shorter questions
5 for you.

6 A Okay.

7 Q First paragraph 149.

8 A Go ahead.

9 Q You refer to the District Court's
10 construction.

11 A Yes.

12 Q Would a person of ordinary skill in the
13 art know the District Court's construction?

14 MS. SPIRES: Object to form.

15 A I don't fully understand your question.

16 Q From the point of view of a person of
17 ordinary skill in the art, that person is at the
18 time of filing, correct?

19 A That's my understanding.

20 Q So could that person of ordinary skill
21 know the Court's claim construction?

22 MS. SPIRES: Object to form. Calls for a

1 legal conclusion.

2 A You're asking if they could see into the
3 future?

4 Q Sure.

5 A Well, they wouldn't be able to see into
6 the future. I do believe that the Court's
7 construction of sector does match a person of
8 skill's understanding of sector at the time.

9 Q But how would the Court's construction
10 affect a person of ordinary skill in the art's
11 determination in whether or not to combine teachings
12 from Vornefeld and Goldberg?

13 MS. SPIRES: Object to form. Calls for a
14 legal conclusion.

15 A Well, the Court's construction of sector
16 certainly means that Goldberg's region -- it
17 clarifies that Goldberg's region does not satisfy
18 sector. That's one motivation behind some of this
19 discussion.

20 Q Goldberg, though, also has sectors as
21 well, correct?

22 And just to help, in column 4 of Goldberg,

1 line 6, it refers to sectorized systems, correct?

2 A I'll get there. My declaration at
3 paragraph 65 states Goldberg -- Goldberg discusses
4 sectors only minimally and does not teach or
5 disclose a broadcast beam signal to more than one
6 sector.

7 But let's go to Goldberg and find evidence
8 that Goldberg only discusses sectors minimally.

9 Q And I direct your attention to column 4,
10 line 6.

11 MS. SPIRES: Monique, could you let us
12 know really quickly how long we have been going on
13 the record?

14 MR. OLIVER: We've got about 10 or 15
15 minutes left. But I'm pretty close, so we're good.

16 A I am at column 4, line 6, where Goldberg
17 says "Sectorized systems using antenna arrays are
18 known in the art," that's true.

19 Right, so I mentioned Goldberg's abstract
20 previously. Goldberg, one of the key points of
21 Goldberg's invention, if not the key point, is using
22 an antenna array to synthesize an effective

1 broadcast beam or an omnidirectional beam. So this
2 whole point of paragraph -- that paragraph 4 --
3 column 4, line 6, Goldberg is simply clarifying that
4 if you -- if you have been using a sectorized
5 system, then omnidirectional does not apply, then I
6 don't mean -- Goldberg is saying that if you happen
7 to be using a sectorized system, then Goldberg's use
8 of the term "omnidirectional" does not really mean
9 360 degrees. "Omnidirectional" in that context of
10 having sectors really just means uniform over the
11 sector.

12 That's all Goldberg says or qualifies
13 about sector. Otherwise, it doesn't say anything
14 about sector. That's why I made that statement in
15 my declaration. I made several statements in my
16 declaration and I've stated them on this record as
17 well.

18 Q And just to be clear, the sectorized
19 systems using antenna arrays discussed in Goldberg
20 at column 4, line 6, are sectors that would match
21 the District Court claim construction, correct?

22 A Yes.

1 MR. OLIVER: All right. I have no further
2 questions.

3 MS. SPIRES: I don't have any questions
4 either.

5 (Time noted: 7:46 p.m.)

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1 CERTIFICATE OF CERTIFIED SHORTHAND REPORTER

2 NOTARY PUBLIC

3 I, MONIQUE VOUTHOURIS, Certified Court
4 Reporter and Notary Public within and for the State
5 of New Jersey, do hereby certify:

6 That DOUGLAS A. CHRISSAN, PH.D., the
7 witness whose deposition is hereinbefore set forth,
8 was duly sworn by me before the commencement of such
9 deposition, and that such deposition was taken
10 before me and is a true record of the testimony
11 given by such witness.

12 I further certify that the adverse party,
13 General Access Solutions, Ltd., was represented by
14 counsel at the deposition.

15 I further certify that the deposition of
16 DOUGLAS A. CHRISSAN, PH.D., occurred remotely via
17 Zoom Videoconference, on Tuesday, June 25, 2024,
18 commencing at 11:00 a.m. to 7:46 p.m. EDT.

19 I further certify that I am not related to
20 any of the parties to this action by blood or
21 marriage, I am not employed by or an attorney to any
22 of the parties to this action, and that I am in no

1 way interested, financially or otherwise, in the
2 outcome of this matter.

3 IN WITNESS WHEREOF, I have hereunto set my
4 hand this 2nd day of July 2024.

5
6
7
8 

9 Monique Vouthouris, CCR, RPR, CRR

10 Notary Public of the State of New Jersey

11 My commission expires: April 8, 2029
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