

1 IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
2 BEFORE THE PATENT TRIAL AND APPEAL BOARD

3 MARVELL SEMICONDUCTOR, INC., : IPR2025-01219
4 Petitioner :
5 VS. :
6 CREDO TECHNOLOGY GROUP LTD. :
 Patent Owner :

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10 ORAL DEPOSITION OF
11 TIM WILLIAMS, PH.D.
12 MENLO PARK, CALIFORNIA
13 THURSDAY, JULY 16, 2026

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22 REPORTED BY:
23 DEBBIE LEONARD, CSR, RDR, CRR
24 CSR NO. 14350
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11 ORAL DEPOSITION OF TIM WILLIAMS, PH.D., at
12 Menlo Park, California, beginning at 9:22 a.m. and
13 ending at 1:50 p.m., on Thursday, July 16, 2026,
14 before Debbie Leonard, CSR, RDR, CRR, Certified
15 Shorthand Reporter No. 14350.

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1 A P P E A R A N C E S

2 COUNSEL FOR THE PETITIONER:

3 SHEPPARD, MULLIN, RICHTER & HAMPTON LLP
4 BY: JEFFREY LIANG, ESQ.
5 HANYUAN (HOLLY) ZHANG, ESQ. (Via Zoom)
6 FRED J.W. CHUNG, ESQ. (Via Zoom)
7 1540 El Camino Real
8 Suite 120
9 Menlo Park, CA 94025
10 (650) 815-2685
11 jliang@sheppard.com
12 hzhang@sheppard.com
13 fchung@sheppard.com

9 COUNSEL FOR THE PATENT OWNER:

10 BENESCH, FRIEDLANDER, COPLAN & ARONOFF LLP
11 BY: THOMAS M. DAMARIO, ESQ.
12 71 South Wacker Drive
13 Suite 1600
14 Chicago, Illinois 60606
15 (312) 212-4949
16 tdamario@beneschlaw.com

16 ALSO PRESENT:

17 Keshav Dandu
18
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1 INDEX TO WITNESSES

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3 WITNESS: TIM WILLIAMS, PH.D.

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BY MR. LIANG

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24 REPORTER'S NOTE: All quotations from exhibits are
25 reflected in the manner in which they were read into the
record and do not necessarily denote an exact quote from
the document.

1 THE REPORTER: My name is Debbie Leonard,
2 California CSR 14350. And with that, I will swear
3 in the witness.

4 TIM WILLIAMS, PH.D.,
5 having been first duly sworn, testified as follows:

6 EXAMINATION

7 BY MR. LIANG:

8 Q Okay. So, Dr. Williams, have you -- I
9 think you've been deposed many times before.

10 A Yes.

11 Q Okay. So I'm still going to go over just a
12 couple ground rules today -- well, how many times
13 have you been deposed?

14 A Over 300.

15 Q Okay. All right. Well, I will still go
16 over some ground rules.

17 So you understand you're under oath to tell
18 the truth today, correct?

19 A Is that a question?

20 Q Yeah.

21 A Yes.

22 Q Okay. And so we'll need verbal responses
23 for the court reporter.

24 You can take a break whenever you need.

25 Just ask that there's no question pending. All

1 right?

2 A Yes.

3 Q Okay. You know that for the deposition
4 today, you're not allowed to discuss your testimony
5 during breaks with your counsel?

6 A That's my understanding.

7 Q Okay. Now, if you don't ask -- if you
8 don't understand a question, just let me know, and
9 I'll rephrase it. All right?

10 A Yes.

11 Q Okay. Are you on any medication today?

12 A No.

13 Q Is there any reason you can't provide
14 truthful and accurate testimony today?

15 A No.

16 Q Okay. So I'm going to hand you just a
17 binder that has a number of exhibits in it. For the
18 record, the binder includes Exhibit 2029, which is
19 your declaration that you submitted in this case;
20 the patent owner response in this case; the
21 petition; and also Exhibits 1001, 1003, 1004, 1005,
22 1006, and 1007.

23 (Previously marked Exhibit 1001,
24 Exhibit 1003, Exhibit 1004, Exhibit 1005,
25 Exhibit 1006, Exhibit 1007, and

1 Exhibit 2029 referenced.)

2 MR. DAMARIO: Counsel, do you have a copy
3 of the binder?

4 MR. LIANG: I actually don't have a copy --
5 an extra copy for you, but these are just the
6 exhibits that are from the proceeding itself.

7 MR. DAMARIO: Okay.

8 BY MR. LIANG:

9 Q You're here to provide testimony about US
10 Patent Number 11,012,252; is that correct?

11 A Correct.

12 Q Okay. And we'll just refer to that as the
13 '252 patent today. Is that fair?

14 A It is.

15 Q And during the deposition today, I may ask
16 you some questions about a person of ordinary skill
17 in the art. And if I use the term "POSITA" to refer
18 to the person of ordinary skill in the art, will you
19 understand what I'm referring to?

20 A I will.

21 Q So how much time have you spent reviewing
22 the '252 patent?

23 A Reviewing? Don't understand the question.

24 Q How many -- how much time have you spent
25 reading the '252 patent?

1 A Don't recall.

2 Q Do you know a ballpark?

3 A No.

4 Q Okay. How much -- do you feel that you
5 fully understand the disclosures in the '252 patent?

6 A Understanding patents is a progressive
7 task. You understand more the more you work with
8 it.

9 Q Do you feel like you need a little more
10 time reviewing the '252 patent before you're
11 comfortable saying that you fully understand it?

12 A I understand it enough to testify about it.

13 Q Had you ever seen the '252 patent before
14 you began working on this matter?

15 A Don't recall.

16 Q How did you prepare for today's deposition?

17 A I reviewed the patent, the patent
18 materials, the declarations, and the materials in
19 the case.

20 Q And by "the materials in the case," do you
21 mean the materials that have been -- like, that --

22 A Exhibits 1000 through 2049 or whatever it
23 is.

24 Q Okay. Did you review any materials that
25 have not been filed as exhibits in this case?

1 A Not that I recall.

2 Q How did you prepare for today's deposition?

3 A Again, reviewed the materials, discussed
4 with attorneys.

5 Q How much time did you spend preparing for
6 the deposition today?

7 A Probably ten hours.

8 Q Did you meet with anybody else, other than
9 your counsel, preparing for the deposition?

10 A No.

11 Q Had you ever heard of Credo before you
12 began working on this matter?

13 A Yes.

14 Q In what -- in what context?

15 A I was involved in a previous litigation.

16 Q In this previous litigation, did Credo
17 retain you as an expert witness?

18 A Yes.

19 Q Which -- which previous litigation was
20 that?

21 A It was the Amphenol case.

22 Q Okay. And before the Amphenol -- before
23 you began working on the Amphenol case, had you ever
24 heard of Credo?

25 A Don't recall.

1 Q Had you ever heard of Marvell before you
2 began working on this matter?

3 A Yes.

4 Q In what context?

5 A Oh, it was a long-time Silicon Valley
6 semiconductor company. I've done work for them
7 before.

8 Q By "work for them," do you mean --

9 A Expert -- expert witness work.

10 Q Okay. When were you first retained in
11 connection with these matters?

12 A Don't recall. It should be in my CV.

13 Q Now, Exhibit 2029 is your declaration,
14 correct? It should be the first thing in the
15 binder.

16 A I guess it's 2029.

17 Yes.

18 Q Okay. How much time did you spend
19 preparing your declaration?

20 A Don't recall.

21 Q Do you have a ballpark; 10 hours, 20 hours,
22 a hundred hours?

23 A Somewhat less than a hundred hours.

24 Q So you got your Ph.D. from UT Austin,
25 correct?

1 A I did.

2 Q And then after that, you eventually got
3 your MBA in 1991, right?

4 A Right after my Ph.D., yes.

5 Q Okay. Did you go straight from the Ph.D.
6 to the MBA program, or did you work in between
7 there?

8 A Well, I was working all the way through,
9 from 1976 to today. So I never stopped earning a
10 paycheck, even while I was going to school. So I
11 was working full-time and going to school.

12 Q When did you start consulting as a
13 technical expert?

14 A 19- -- 1999.

15 Q Do you remember what matter that was for?

16 A It's in my CV.

17 Q Okay. I saw in your CV that you had worked
18 for Motorola. What did you do at Motorola?

19 A Designed chipsets. So I started out in the
20 voice privacy section, where I designed chipsets for
21 encryption of voice for transmission over land,
22 mobile, or radio frequencies, and then moved to
23 Austin and designed chipsets for telecom use,
24 ISDN-type services, networks, cellular networks. So
25 I designed all the chips for Motorola's cell phones

1 for many years.

2 Q What did you do --

3 A Sorry. Let me correct that. All the
4 baseband and modem chips, not the RF chips.

5 Q What did you do at Atheros?

6 A At Atheros, I was CEO.

7 Q And then after you left Atheros, you went
8 to, I think, JetQue. What is -- what did you do at
9 JetQue?

10 A JetQue developed -- developed ICs for
11 communication networks.

12 Q What kind of ICs were they?

13 A They were modem and baseband protocol
14 chips.

15 Q For what kind of communication networks?

16 A Primarily, cellular.

17 Q I saw after that you went to -- was it --
18 is it pronounced DoceoTech?

19 A DoceoTech.

20 Q DoceoTech. What did you do at DoceoTech?

21 A I was the CEO and founder. That was a
22 training company.

23 Q What did it do training for?

24 A Oh, gosh. All the primary telecom
25 protocols and networks of the day, cellular

1 protocols and networks. Wi-Fi networks, protocols.

2 Q And after that, I saw you went to -- I
3 think it's called -- is it SiBEAM or --

4 A Uh-huh, SiBEAM.

5 Q So what did -- what did you do at -- what
6 did you do at SiBEAM?

7 A SiBEAM was a 60-gigahertz carrier, wireless
8 LAN chipset provider, and I was CEO.

9 Q So you also passed the patent bar; is that
10 right?

11 A Yes.

12 Q Are you a registered patent agent?

13 A I am.

14 Q Are you familiar with the MPEP?

15 A I am.

16 Q What is the MPEP?

17 A It's a manual of procedures for the
18 examiners in the -- in the patent office.

19 Q So I want to ask you some questions about
20 your legal understanding that you applied when
21 providing your opinions in this case.

22 A I'm not a lawyer.

23 Q Understood. But I'm just asking you about
24 your understanding of the law. You provided some
25 opinions about anticipation or obviousness, and so

1 I'm going to ask you about the -- your understanding
2 of the law that you provide -- that you applied when
3 you provided the opinions in your declaration. All
4 right?

5 A That's detailed in my report.

6 Q Okay. So in your understanding, what is
7 required for a prior art reference to render a
8 patent claim obvious?

9 MR. DAMARIO: Object to form.

10 THE WITNESS: Under which statute?

11 BY MR. LIANG:

12 Q Under the understanding of the law that you
13 applied.

14 A 102? 103? I don't understand your
15 question.

16 Q Okay. So under Section 103, what is the
17 understanding that you provide -- you applied when
18 you provided your opinions regarding obviousness in
19 this case?

20 A Those are detailed in paragraphs 25 through
21 34 of my report, Exhibit 2029.

22 Q Would you agree that familiar items may
23 have obvious uses beyond their primary purposes and
24 in many cases a POSITA will be able to fit the
25 teachings of multiple patents together like pieces

1 of a puzzle?

2 MR. DAMARIO: Object to form.

3 THE WITNESS: Don't understand the
4 question.

5 BY MR. LIANG:

6 Q In formulating your opinions for
7 obviousness, did you apply an understanding that
8 familiar items may have obvious uses beyond their
9 primary purposes and in many cases a POSITA will be
10 able to fit the teachings of multiple patents
11 together like pieces of a puzzle?

12 A Don't understand "familiar items."

13 Q Okay. So would the answer be no?

14 A The answer is, I don't understand the
15 question.

16 Q Okay. So you don't understand what it
17 means that familiar items may have obvious uses
18 beyond their primary purposes?

19 MR. DAMARIO: Object to form.

20 THE WITNESS: I don't understand what you
21 mean by "familiar items."

22 BY MR. LIANG:

23 Q When forming your opinions in this case,
24 did you apply an understanding that a person of
25 ordinary skill is also a person of ordinary

1 creativity?

2 A Not specifically.

3 Q Can a motivation to combine be provided by
4 common sense?

5 A Yes.

6 Q Can any need or problem known provide a
7 reason for combining the elements in the manner
8 claimed?

9 A Can I have the question again, please.

10 Q Can any need or problem known provide a
11 reason for combining the elements in the manner
12 claimed?

13 MR. DAMARIO: Object to form.

14 THE WITNESS: Don't understand the
15 question.

16 BY MR. LIANG:

17 Q Did your obviousness analysis take into
18 account inferences, creative steps, common sense,
19 and practical logic that a person of ordinary skill
20 in the art would employ?

21 A Well, I'll answer it this way. A POSITA
22 comes to a document with -- a patent with a set of
23 skills, set of tools that they have based on their
24 education, their experience, and I expect them to
25 use that level of skills and experience in

1 attempting to solve the problem outlined by the
2 patent.

3 Q When forming your opinions in this case,
4 did you apply an understanding that combining prior
5 art techniques that are interoperable with respect
6 to one another is generally obvious?

7 A "Interoperable"? Don't understand the
8 question.

9 Q So you don't understand what
10 "interoperable" means?

11 A I don't understand what you mean by
12 "interoperable."

13 Q Have you ever used that word yourself?

14 A Of course.

15 Q What is your understanding of the word
16 "interoperable"?

17 A Different things in different contexts. I
18 don't understand what you mean.

19 Q Give me an example of what -- how you've
20 used the word "interoperable" with respect to
21 technology.

22 A Can't think of an example.

23 Q Does an obviousness combination require a
24 physical combination of references?

25 A A physical combination of references.

1 I'm not sure I understand the question,
2 "physical combination." So these are mental
3 exercises, not physical exercises.

4 Q Okay. So an obviousness combination does
5 not require the incorporation of, like, one
6 embodiment from one reference into the structure of
7 another?

8 MR. DAMARIO: Object to form.

9 THE WITNESS: Depends on the particular
10 situation. The -- depends on the situation.

11 BY MR. LIANG:

12 Q So in some situations, obviousness may
13 require incorporating one reference into the other;
14 is that fair?

15 A Usually not. In my experience,
16 incorporation of the teachings of one reference
17 specifically as taught into another reference is not
18 a requirement of anticipation.

19 Q And what about obviousness?

20 A Or obviousness. Sorry. Misspoke.

21 Q Would you agree that for a reference to
22 teach away, it must criticize, discredit, or
23 otherwise discourage a POSITA?

24 MR. DAMARIO: Object to form.

25 THE WITNESS: It can do that, or it can

1 indicate that the solution being proposed by that
2 reference is the optimal solution.

3 BY MR. LIANG:

4 Q So a reference can teach away from a
5 solution if it describes another solution as being
6 optimal?

7 A In my opinion, yes.

8 Q What's the difference between a prior art
9 disclosure that says something may be done versus
10 something must be done?

11 MR. DAMARIO: Object to form.

12 THE WITNESS: Must is required. May is
13 optional.

14 BY MR. LIANG:

15 Q What about a prior art reference that says
16 that something can be done?

17 A That's an optional element.

18 Q When you were forming your opinions for
19 obviousness, did you apply an understanding that one
20 must consider the combined teachings of the prior
21 art as a whole?

22 A Generally, that's not required. Only
23 certain elements of a prior art reference may be
24 incorporated into another reference for -- for
25 invalidation.

1 Q When a prior art reference has a preferred
2 embodiment, does that preclude one of ordinary skill
3 in the art from using other embodiments?

4 A No.

5 Q So if a prior art reference has one
6 embodiment that's technically superior and another
7 that's suboptimal, an obviousness rationale could
8 still be based on the suboptimal embodiment?

9 A Yes, but that reference is essentially
10 teaching away from the suboptimal mechanism or
11 methodology.

12 Q Will you agree that a known combination
13 does not become patentable simply because it is
14 described as inferior to some other alternative for
15 the same use?

16 A I think you're asking me a legal question.

17 Q When you were applying your understanding
18 of the law to form your opinions on obviousness, did
19 you apply an understanding that a known combination
20 does not become patentable simply because it has
21 been described as inferior to some other alternative
22 for the same use?

23 MR. DAMARIO: Object to form.

24 THE WITNESS: Don't understand the
25 question.

1 BY MR. LIANG:

2 Q Who don't you understand about the
3 question?

4 A Don't understand it.

5 Q Can you elaborate at all?

6 A No. I just don't understand the question.

7 Q It sounds like when applying your
8 understanding of the law in forming your opinions of
9 obviousness, you did not apply an understanding that
10 a known combination does not become patentable
11 simply because it has been described as inferior to
12 some other alternative for the same use.

13 MR. DAMARIO: Object to form.

14 BY MR. LIANG:

15 Q Fair?

16 A That's not my testimony.

17 Q Okay. I'm just trying to understand if --
18 if you applied this understanding or not. It sounds
19 like if you didn't understand this concept, then you
20 would not have applied it in your opinions. Is that
21 fair?

22 A I'm not testifying that I did not
23 understand it. I don't understand your question.

24 Q Okay. And if you -- if you can elaborate,
25 I can --

1 A Can you break down your question?

2 Q Well, let me ask you this. Is it your view
3 that a known combination would become patentable if
4 it is described as inferior to some other
5 alternative?

6 A Let's go back to basics here. So what do
7 you mean by "known combination"?

8 Q A known combination of prior art elements.

9 A In what way is it known?

10 Q It's disclosed in prior art.

11 A So a combination of elements described in a
12 prior art reference. And then what's your next
13 part?

14 Q Is it your view that that known combination
15 becomes patentable simply because it is described as
16 inferior to some other alternative?

17 A I think that's a legal question.

18 Q And is that --

19 A It calls for a legal conclusion.

20 Q Is that an understanding that you applied
21 when forming your opinions in this case?

22 A I don't recall that I had a chance to apply
23 that in this case. But I would refer you to an
24 attorney.

25 Q Would you agree that a particular

1 combination must be preferred or at least the most
2 desirable combination for there to be a motivation
3 to combine?

4 A Combination of what?

5 Q Prior art elements.

6 A Can I have the question again, please?

7 Q Would you agree that a particular
8 combination must be preferred or the most desirable
9 combination for there to be a motivation to combine?

10 MR. DAMARIO: Object to form.

11 THE WITNESS: Again, I think that's a legal
12 question.

13 BY MR. LIANG:

14 Q Right. And this -- for this line of
15 questions, I'm trying to ask some questions to
16 understand, you know, what was your understanding of
17 the law that you provided -- that you applied,
18 right, when you provided opinions on obviousness in
19 this case.

20 You understand that one of the aspects of
21 obviousness relates to a motivation to combine prior
22 art elements?

23 A Yes.

24 Q And you have provided opinions about the
25 motivation to combine that's been discussed in this

1 case, right?

2 A I have.

3 Q Did you apply an understanding that a
4 particular combination must be the preferred or most
5 desirable combination for there to be a motivation
6 to combine?

7 MR. DAMARIO: Object to form.

8 THE WITNESS: Don't recall.

9 BY MR. LIANG:

10 Q But you do agree, then, that a particular
11 combination would not have to be the most preferred
12 or most desirable combination for there to be a
13 motivation to combine?

14 MR. DAMARIO: Object to form.

15 THE WITNESS: Depends on the situation.

16 BY MR. LIANG:

17 Q Would you agree that simplicity may
18 constitute great excellence and value for an
19 invention?

20 MR. DAMARIO: Object to form.

21 THE WITNESS: I've never said that.

22 BY MR. LIANG:

23 Q Can you disagree with that idea?

24 A I'm not expressing that opinion.

25 Q But you're not disagreeing with the opinion

1 either?

2 A I have no opinion.

3 Q If a design is technically inferior, that
4 means it is prone to failure, correct?

5 MR. DAMARIO: Object to form.

6 THE WITNESS: Not necessarily.

7 BY MR. LIANG:

8 Q Why not?

9 A It depends on your criteria for
10 inferiority.

11 Q Well, if a design is suboptimal, that would
12 mean it's prone to failure, right?

13 A Not necessarily.

14 Q Why not?

15 A Depends on your criteria for suboptimal.

16 Q In what criteria would suboptimal not lead
17 to failure?

18 A A solution may work perfectly fine but may
19 be more costly, may be more slower data rates, may
20 be more issues in communicating. Higher bit error
21 rates, for example. That's not a failure.

22 Q Are you familiar with a concept of a file
23 history for a patent?

24 A I am.

25 Q What is the file history?

1 A It's the documentation of the examination
2 of the application in front of the patent office.

3 Q Is that synonymous with the prosecution
4 history?

5 A In front of the patent office, yes.

6 Q Have you ever heard of an Information
7 Disclosure Statement?

8 A Yes, an IDS.

9 Q What's an IDS?

10 A It's the -- a patentee telling the patent
11 office, "These are references that relate to the
12 application."

13 Q So you've worked for a long time in the
14 industry, so I assume you have heard of the term
15 "modulation."

16 A Yes.

17 Q Okay. So what is modulation?

18 A Modulation is the placing of information
19 onto a carrier.

20 Q And what is demodulation?

21 A Demodulation is the removal of that
22 information from the carrier.

23 Q So demodulation would be the inverse
24 process of modulation?

25 A Yes.

1 Q Have you ever heard of NRZ?

2 A Yes.

3 Q What is NRZ?

4 A It's a particular type of coding for
5 encoding information to be transmitted over
6 communication channels.

7 Q Can you describe the coding that is used
8 for NRZ?

9 A You mean the algorithm?

10 Q Yeah, well, let me just ask first, do you
11 know what NRZ stands for?

12 A Non-return-to-zero.

13 Q Okay. And can you just describe, then, the
14 coding that's used for NRZ?

15 A Well, there are various mechanisms for NRZ
16 coding. One is just transmission of a positive
17 symbol and a negative symbol subsequently on the
18 line, on the communication channel.

19 Q What is PAM4?

20 A PAM4 is pulse amplitude modulation with
21 four levels.

22 Q PAM4 is a modulation scheme with multiple
23 levels?

24 A Yes, four levels. Four levels on the
25 communication channel.

1 Q What's the difference between PAM4 and NRZ?

2 A Don't recall.

3 Q When would NRZ be more useful compared to
4 PAM4?

5 A Depends on the characteristics of the
6 communication channel, between these two
7 methodologies.

8 Q What is a backplane?

9 A Backplane is typically a printed circuit
10 board that is used to interconnect other boards or
11 other modules in order to accomplish some task.

12 Q I want to ask you a few questions about
13 Exhibit 1004, which I'm going to refer to as
14 Lugthart. If you could please turn to that. I
15 believe it's the fourth element in the binder.

16 A Okay.

17 Q Oh, no. Wait. I'm sorry. It may be the
18 eighth --

19 A Yeah, it's 8 --

20 Q -- in the binder.

21 A It's 8.

22 Q If you can turn to Figure 2A of Lugthart.

23 A Yes.

24 Q Is there a -- is there a cable shown in
25 Figure 2A?

1 A [Reviewing.]

2 Yes.

3 Q What part of Figure 2A is part of the
4 cable?

5 A Part of the cable?

6 Q Or where --

7 A Element 111.

8 Q And the -- what is described by, you know,
9 the dotted lines marked as element 110?

10 A The Lugthart reference calls element 110
11 "the cable."

12 Q Electronic device 1 in Figure 2A would be a
13 host device, correct?

14 A Yes.

15 Q Electronic device 2 would be a different
16 host device, correct?

17 A Correct.

18 Q And electronic devices 1 and 2 could be any
19 number of different hosts, correct?

20 A Correct.

21 Q For example, electronic devices 1 and 2
22 could be a workstation, correct?

23 A Correct.

24 Q Electronic devices 1 and 2 could be a
25 supercomputer, correct?

1 A Yes.

2 Q Electronic devices 1 or 2 could be network
3 router, correct?

4 A Yes.

5 Q And network devices -- electronic -- sorry.
6 Withdrawn.

7 Electronic devices 1 or 2 could be desktop
8 computers, correct?

9 A Yes.

10 Q Electronic devices 1 and 2 could be hosts
11 on data transport networks, correct?

12 A Hosts on data transport networks. Host on
13 data -- don't know what you mean.

14 Q Electronic devices 1 and 2 could be hosts
15 on enterprise networks, correct?

16 A Yes.

17 Q Figure 2A shows a host side connection from
18 each transceiver in the active cable to the TX and
19 RX in the nearest electronic device, correct?

20 A That's correct.

21 Q The cable side connection would be between
22 the transceivers inside the active cable, correct?

23 A I think that's correct. Can I have the
24 question again, please?

25 Q The cable side connection would be between

1 the transceivers inside the active cable, correct?

2 A Yes.

3 Q And that cable side connection is sometimes
4 referred to as a line side connection, correct?

5 A Yes.

6 Q And in Figure 2A, that would be shown as
7 the lines marked 111, correct?

8 A Correct.

9 Q Can you explain to me, what is
10 equalization?

11 A Equalization is compensation for the
12 effects of transmission down a communication
13 channel.

14 Q What does equalization do to a signal?

15 A Depends on what it's equalizing.

16 In general -- in general transmission down
17 a copper pair -- for example, 111 -- an example of
18 one instantiation of 111 is a copper line.

19 Transmission down a copper line will lose
20 higher frequencies as the waves propagate down the
21 copper medium, and equalization boosts the
22 higher-end frequencies in order to compensate for
23 losses occurring during transmission down the copper
24 path.

25 That's one form of equalization.

1 Q How do equalization parameters affect
2 equalization?

3 A The parameters define the characteristics
4 of what is being emphasized or de-emphasized about
5 the transmission.

6 Q What is adaptive equalization?

7 A It is the use of algorithms to measure an
8 effect of a particular set of taps or coefficients
9 and then adapt those taps or coefficients to achieve
10 some particular criteria.

11 Q When does adaptation occur?

12 A In what?

13 Q So for an active cable that uses adaptive
14 equalization, when would adaptation occur?

15 A Depends.

16 Q What does it depend on?

17 A When the algorithms were set to perform the
18 adaptation algorithms.

19 Q Does adaptation occur during the normal
20 operation of a cable?

21 A Depends.

22 Q Adaptation can be used outside of the
23 normal operation of a cable; is that fair?

24 A I don't have an example in mind of that.
25 Do you?

1 Q So then, for every example you can think
2 of, adaptation occurs during normal operation of the
3 cable; is that fair?

4 MR. DAMARIO: Object to form.

5 THE WITNESS: Well, it depends on what you
6 mean by "normal operation."

7 I mean, a cable -- in order for the
8 adaption processes that I'm thinking of to be
9 operational, the media needs to be carrying some
10 level of information. So that would be normal use.
11 I don't know how it would adapt without that.

12 BY MR. LIANG:

13 Q Have you ever used the phrase "normal
14 operation of a cable"?

15 A Not that I recall.

16 Q In order for adaptation to occur, you have
17 to -- you're saying that you have to send some
18 amount of data and then you measure the amount of
19 error you're getting and you adjust your
20 coefficients? Is that accurate?

21 A Generally. There's -- the adaption is a
22 process of probing, measurement, adaption,
23 correction, probe again, measurement, adaption,
24 correction. So it's a loop.

25 Q So an active cable would need to be

1 connected in order for adaptation to occur, correct?

2 A Connected to what?

3 Q Connected to something that can send data,
4 perform these operations that you've discussed.

5 A Are you asking, if there were just a cable
6 laying on the table here not connected to anything,
7 could it perform an adaptation of its equalization
8 coefficients?

9 Q Correct.

10 A Not to my understanding.

11 Q Can you explain to me, what is Ethernet?

12 A Ethernet is a collection of standards.

13 Q Does Ethernet refer to a cable or a
14 protocol?

15 A It refers to all levels of standardization.
16 I mean, it's a whole collection of standards.

17 Q Ethernet is widely used in LANs; is that
18 fair?

19 A Yes.

20 Q And it's standardized as IEEE 802.3?

21 A Yes, that's the -- that's the standards
22 group within IEEE that is responsible for creating
23 the standards associated with local area
24 communications.

25 Q So 2019, the Ethernet protocol was used

1 over a variety of different types of cables,
2 correct?

3 A You mean different physical media?

4 Q Yeah. So Ethernet was used over Cat5
5 cables, right?

6 A In 2019, yes.

7 Q And by 2019, Ethernet was used over Cat6
8 cables, correct?

9 A Correct.

10 Q And by 2019, Ethernet was used over
11 twinaxial cables, correct?

12 A Yes.

13 Q So by 2019, the Ethernet protocol was used
14 over a variety of different types of cables; is that
15 fair?

16 A Well, let's be careful in our terminology
17 today. The Ethernet protocol is -- Ethernet is a
18 collection of protocols, not one single protocol.

19 Q Okay. But you'd agree, though, at 2019,
20 Ethernet was used over a variety of different
21 cables, right?

22 A Physical media cables, yes, true.

23 Q And by 2019, Ethernet was also used over a
24 variety of different connectors, right?

25 A Yes.

1 Q Have you ever heard of something called
2 loopback mode?

3 A Yes.

4 Q What is loopback mode?

5 A Loopback is a mechanism in communications
6 engineering where you send information in one
7 direction and then that information is repeated by
8 the far end and brought back to the original
9 transmitter.

10 Q Why would you do that?

11 A In order to find degradation in the
12 transmission and measure the overall communication
13 capabilities of the media.

14 Q Would loopback be used for testing?

15 A Typically.

16 Q I'd like to ask you a few questions about
17 the '252 patent. Do you agree that the '252 patent
18 relates to active Ethernet cables?

19 A [Reviewing.]

20 Yes. Not restricted to Ethernet.

21 Q Okay. So looking at Figure 1 of the '252
22 patent -- let me know when you get to Figure 1.

23 A I'm there.

24 Q Okay. Is Figure 1 an active Ethernet
25 cable?

1 A The patent does describe Figure 1 as "a
2 perspective view of an illustrative active
3 Ethernet cable."

4 Q If you look at Figure 2, is there a
5 transceiver in Figure 2?

6 A Figure 2 is "a function-block diagram of
7 the illustrative cable."

8 Is there a transceiver? Depends on the
9 implementation. There are transmitters, and there
10 are receivers.

11 Q Are you able to identify a transceiver in
12 Figure 2?

13 A Depends on the implementation. There are
14 transmitters, and there are receivers in Figure 2.

15 Q So I'm just asking about, you know, what a
16 POSITA would know, looking at the '252 patent.

17 Would you be able to identify a transceiver
18 in Figure 2 from the perspective of a POSITA?

19 A Same answer.

20 Q So just looking at the -- you know, within
21 the '252 patent itself, it wouldn't be clear that
22 there is a transceiver in Figure 2; is that fair?

23 MR. DAMARIO: Object to form.

24 THE WITNESS: That's not my testimony.

25 BY MR. LIANG:

1 Q Okay. Well, from the perspective of a
2 POSITA, looking at the '252 patent, can you identify
3 a transceiver in Figure 2?

4 A No.

5 Q Now, there's -- there's a term that's
6 sometimes used, "clock and data recovery." Do you
7 know what that is?

8 A Yes.

9 Q What is clock and data recovery?

10 A It's examining the transmitted waveform to
11 determine the clock information as well as the data
12 information that's being received down the line.

13 Q Sometimes "clock and data recovery" is
14 abbreviated as CDR, correct?

15 A It is.

16 Q It's actually a pretty common acronym
17 that's used, right?

18 A In some circles, yeah.

19 Q There are some transmitter and receiver
20 pairs in Figure 2.

21 A Is that a question?

22 Q So each lane in Figure 2 has symmetrical TX
23 and RX paths; is that fair?

24 A Each lane has symmetrical --
25 Symmetrical around what axis?

1 Q Do you believe there's any symmetry in the
2 lanes shown --

3 A I just don't understand the question. Each
4 lane has a transmitter and a receiver.

5 Q Do you believe there's any symmetry in
6 lane 0 as shown in Figure 2?

7 A Symmetry with respect to what? I don't
8 understand the question.

9 Q So you don't see any symmetry in lane 0 of
10 Figure 2?

11 A I don't understand the question.

12 Q Have you ever used the word "symmetry"
13 before?

14 A Of course.

15 Q Okay. Are you able to identify any
16 symmetry that you see in lane 0?

17 A Symmetry with respect to what?

18 Q Anything. Any symmetry. Are you not able
19 to identify any symmetry in lane 0?

20 MR. DAMARIO: Object to form.

21 THE WITNESS: Don't understand the
22 question.

23 BY MR. LIANG:

24 Q Okay. So you don't understand the concept
25 that there may be symmetry between the transmit and

1 receive directions of lane 0 in Figure 2; is that
2 fair?

3 A That's not my testimony.

4 Q Okay. Then please explain the symmetry
5 that you see in the transmit and receive directions
6 of lane 0 in Figure 2.

7 A I have not testified that I do see
8 symmetry, and I'm trying to understand what you mean
9 by "symmetry."

10 Q What do you think "symmetry" means?

11 A It can mean many things in many situations.
12 I don't know what you mean.

13 Q Have you ever used "symmetry" to
14 describe -- to describe a communication system?

15 A Not that I recall.

16 Q Does Figure 2 show the form factor that
17 retimer silicon should take within a cable
18 connector?

19 A The form factor? No. Figure 2 is just a
20 functional block diagram. There's no form factors.

21 Q Does Figure 2 show how power would be
22 delivered to a retimer in a cable connector?

23 A No. Figure 2 is just a functional block
24 diagram.

25 Q Could you turn to Figure 3.

1 A Yes.

2 Q Does Figure 3 include any transceivers?

3 A I would not expect Figure 3, which is an
4 architectural diagram for a communications link,
5 including the illustrative cable, to specify at the
6 level of transceiver.

7 Q Is there a host side part of the setup that
8 is shown in Figure 3?

9 A Yes.

10 Q What would that be?

11 A Host side of the cable? Is that your
12 question?

13 Q Correct.

14 A Yes. It would be connector 202 and 204.

15 Q And what part is the line side of the
16 cable?

17 A Connector is not labeled, but it would be
18 the portion that interconnects with element 306.

19 Q Where does equalization happen in Figure 3?

20 A [Reviewing.]

21 Column 6, lines 22 to 38, "The PMA Sublayer
22 provides lane remapping, symbol encoding/decoding,
23 framing, and octet/symbol synchronization. The PMD
24 Sublayer specifies the receiver conversions between
25 the transmitted and received channel signals and the

1 corresponding bit (or digital symbol) streams.
2 optional AN Sublayer is shown as the internal
3 element of the PMD Sublayer, and implements an
4 initial start-up of the communication channels,
5 conducting an auto-negotiation phase and a link-
6 training phase before entering a normal operating
7 phase. The auto-negotiation phase enables the end
8 nodes to exchange information about their
9 capability, and the training phase enables end nodes
10 to adapt both transmit- and receive-side
11 equalization filters in a fashion that combats the
12 channel non-idealities. The receptacle 336 is also
13 shown as part of the PMD sublayer to represent the
14 physical network interface port."

15 Q Does the '252 patent disclose details of
16 Ethernet pinouts?

17 A Don't recall.

18 Q Does the '252 patent disclose details of
19 configuration detection circuitry?

20 A Don't recall.

21 Q So what does it mean for equalization
22 parameters to be fixed?

23 A It's that one or more parameters of the
24 equalizer do not change over time.

25 Q Are you familiar with the references

1 Cornelius and Samaan?

2 A Yes.

3 Q How much time did you spend reviewing
4 Cornelius?

5 A Don't recall.

6 Q How much time did you spend reviewing
7 Samaan?

8 A Don't recall.

9 Q Does Cornelius teach fixed or adaptive
10 equalization parameters?

11 A [Reviewing.]

12 Q We could -- we could shortcut this a bit if
13 you want to look at -- I can refer you to Cornelius,
14 column 11, line 51. That's Exhibit 1006, column 11,
15 line 51. Let me know when you get there.

16 A I'm there. And what's the question?

17 Q In column 11, line 51, Cornelius says, "In
18 variance embodiments of the present invention,
19 parameters for these circuits may be calibrated or
20 otherwise determined by the manufacturer and stored
21 as presets for loading during operation."

22 Do you see that?

23 A No.

24 Q Line 51 of column 11.

25 A 51. Sorry.

1 Q Column 11, line 51, Cornelius says, "In
2 various embodiments of the present invention,
3 parameters for these circuits may be calibrated or
4 otherwise determined by the manufacturer and stored
5 as presets for loading during operation."

6 Do you see that text?

7 A No. 51 -- column 11, 51 --

8 Q Of Exhibit --

9 A -- says, "These circuits may be adjusted
10 using various parameters."

11 55 says, "In other embodiments" --

12 Q Oh, I'm actually just in the next sentence
13 after what -- the one you just read.

14 A Oh. Okay. "These circuits may be adjusted
15 using various parameters. In various embodiments of
16 the present invention, parameters for these circuits
17 may be calibrated or otherwise determined by the
18 manufacture and stored as presets for loading during
19 operation."

20 Q Okay. So in that sentence that you just
21 read, Cornelius is describing fixed parameters,
22 correct?

23 MR. DAMARIO: Object to form.

24 THE WITNESS: [Reviewing.]

25 Can I have the question again, please?

1 BY MR. LIANG:

2 Q In Cornelius, column 11, lines 51 through
3 54, Cornelius describes fixed parameters that are
4 determined by the manufacturer and stored as
5 presets, correct?

6 A No. I discuss this in my declaration in
7 paragraphs 60 to 65.

8 Q Why not?

9 A Well, you can read 60 to 65. That's
10 exactly the reason why not.

11 Q Okay. So looking at paragraph 62, you say,
12 "I disagree that this passage teaches parameters
13 that remain fixed and unchanging during normal cable
14 operation."

15 And then you continue on, "In the field of
16 high-speed...communications, the term 'presets'" --
17 and the paragraph keeps going.

18 Is it your opinion that in the field of
19 high-speed communications, the term "presets"
20 typically refers to initial starting values that are
21 loaded at the commencement of operation?

22 A You read that directly from my declaration.

23 Q So for adaptive training, initial starting
24 values would be loaded into registers when the cable
25 begins operation, correct?

1 A Again, you read that from my declaration.

2 Q And then the initial values would be
3 adjusted during the adaptation process, correct?

4 A It's -- the reference does not suggest that
5 these values remain unchanged.

6 Q So, therefore, these values are not fixed,
7 in your opinion?

8 A Correct.

9 Q Because even though the manufacturer sets
10 these initial values --

11 A Presets.

12 Q -- in an adaptive training, the initial
13 values would be adjusted and changed during the
14 adaptation process; is that correct?

15 A They can be.

16 Q And you're leaving open the possibility
17 that with adaptation, the parameters might not be
18 adjusted or changed during adaptation; is that fair?

19 A Well, as I go on to discuss, Cornelius
20 discusses actually adapting those values. So
21 Cornelius doesn't disclose the fixed nature of those
22 values.

23 Again, it's in these paragraphs.

24 Q Because Cornelius discloses adaptation?

25 A Correct.

1 Q But you're leaving open the possibility
2 that adaptation might not change the equalization
3 parameters, correct?

4 MR. DAMARIO: Object to form.

5 THE WITNESS: [Reviewing.]

6 As I say in paragraph 60, last sentence,
7 "In the context of the '252 Patent, 'fixed'
8 parameters are values that do not change during
9 normal operation of the cable - they are established
10 once and remain constant thereafter."

11 BY MR. LIANG:

12 Q All right. So I guess I'm just asking you
13 about adaptation.

14 It seems like you have the opinion that
15 because Cornelius discloses adaptation, then
16 Cornelius' parameters are adjusted during the normal
17 operation of the cable. Is that fair?

18 A Cornelius teaches that, yes.

19 Q So looking at paragraph 62, you're
20 interpreting Cornelius in terms of, you know, its
21 disclosures in the field of high-speed serial
22 communications, correct?

23 A I'm reading Cornelius as a POSITA.

24 Q And in the field of high-speed serial
25 communications, then, the term "presets" typically

1 refers to initial starting values that get loaded
2 into registers when the cable begins operations, and
3 then those initial values would be adjusted during
4 adaptation; is that correct?

5 A You're drawing a generality from the
6 teachings of Cornelius, which I don't --

7 Q Well, I'm actually --

8 A -- necessarily agree.

9 Q Okay. So I'm actually just asking about
10 your opinion in paragraph 62 where you talk about
11 sort of -- where you're talking about the field of
12 high-speed serial communications.

13 Is that how you are -- what you're using to
14 interpret Cornelius?

15 A What do you mean by that? That Cornelius
16 is related to the field of high-speed serial
17 communications?

18 Q Okay. So sounds like you actually --

19 A Is that your question?

20 Q So it sounds like you disagree with the
21 generalization that "presets" typically refers to
22 initial starting values.

23 MR. DAMARIO: Object to form.

24 THE WITNESS: I didn't express an opinion
25 one way or the other. I'm just saying this opinion

1 relates to Cornelius, and you're drawing a general
2 conclusion based on my statements and Cornelius,
3 which I don't -- I don't think is supported one way
4 or the other.

5 BY MR. LIANG:

6 Q If we could turn to your declaration,
7 paragraph 17.

8 A Yes.

9 Q In paragraph 17, you have the definition of
10 a POSITA that you applied in this case; is that
11 fair?

12 A I do.

13 Q And you note that a POSITA would have had
14 "at least three years of experience working in high
15 speed data communication"?

16 A Yes.

17 Q What do you consider to be high-speed data
18 communication?

19 A Data communications that occur at high
20 speed.

21 Q What would you consider to be high speed?

22 A In what time frame?

23 Q In the 2019 time frame.

24 A Gigabit per second, 50 gigabits per second,
25 a hundred gigabits per second.

1 Q What are some examples of standards in the
2 2019 time frame that provided high-speed data
3 communication?

4 A [Reviewing.]

5 Can I have the question again, please?

6 Q What are some examples of standards in the
7 2019 time frame that provided high-speed data
8 communication?

9 A An example would be 802.- -- 802.3-2015,
10 which is the -- in the MAC controller layer for
11 high-speed communications over multiple types of
12 physical media.

13 Q And as we talked about before, 802.3 would
14 be an Ethernet standard, correct?

15 A 802.3 is the committee that forms the
16 standards for local area communications in IEEE.
17 802.3 includes multiple standards for that mechanism
18 of communications.

19 So 802.3 is a collection of standards, one
20 of which is Ethernet over copper pair. For example,
21 1000BASE-T is a standard for Ethernet communications
22 over copper wire.

23 Q So 1000BASE-T would be a standard for
24 Ethernet that is an example of high-speed data
25 communications; is that fair?

1 A In 2019, yes.

2 Q What are some other examples of standards
3 that provide -- well, withdrawn.

4 What were you -- in terms of your, like,
5 professional employment, what were you doing in the
6 2019 time frame?

7 A Can I have my CV?

8 Q Is it not part of that -- oh, is it a
9 different exhibit?

10 A Doesn't look like it got printed. It
11 didn't get printed.

12 Q Do you recall offhand what you were doing
13 in 2019?

14 A Not to the level of specificity required in
15 a deposition.

16 Q Do you remember where you were employed at
17 in 2019?

18 A Don't recall. Again, it's in my CV.

19 MR. LIANG: So we've been going for a
20 little while. Let's take a short break.

21 (Recess taken from 10:55 a.m. to
22 11:19 a.m.)

23 BY MR. LIANG:

24 Q By 2019, would a POSITA have been able to
25 implement an Intel retimer design in an active

1 cable?

2 A I've not expressed that opinion.

3 Q Do you disagree that by 2019, a POSITA
4 would have been able to implement an Intel retimer
5 design in an active cable?

6 A I have not expressed that opinion.

7 Q Samaan teaches an Intel retimer design,
8 correct?

9 A Yes.

10 Q Would you agree that by 2019, a POSITA
11 would have known how to implement retimers within an
12 active cable assembly?

13 A I've not expressed that opinion.

14 Q Do you disagree that a POSITA in 2019 would
15 have known how to implement retimers within an
16 active cable assembly?

17 A I have no -- I've expressed no opinion one
18 way or the other.

19 Q By 2019, a POSITA would have been able to
20 retime data at each end of an active cable, correct?

21 A [Reviewing.]

22 The question again, please?

23 Q By 2019, a POSITA would have been able to
24 retime data at each end of an active cable, correct?

25 A I have not expressed that opinion.

1 Q In forming your opinions, you did not
2 consider whether by 2019, a POSITA would have been
3 able to implement circuits for retiming data inside
4 the plugs at each end of an active cable; is that
5 fair?

6 A [Reviewing.]

7 That opinion is not required for my
8 analysis, since my report is in response to
9 Dr. Chen's report.

10 Q In forming your opinions, you also did not
11 consider whether by 2019, a POSITA would have been
12 able to retime data at each end of an active cable,
13 correct?

14 A My comments in this declaration are in
15 response to Dr. Chen's comments, and my analysis is
16 self-contained within my report.

17 Q Right. And you have your report in front
18 of you. I'm just asking you whether, in forming
19 your opinion, you considered whether by 2019, a
20 POSITA would have been able to retime data at each
21 end of an active cable.

22 A I did not perform that analysis.

23 Q But you do agree that by 2019, a POSITA
24 would have been able to make and use an active cable
25 with two plugs, right?

1 A I've not expressed that opinion.

2 Q In forming your opinions, did you consider
3 whether a POSITA would have been able to make and
4 use an active cable with clock and data recovery
5 circuits for retiming signals received at both
6 plugs?

7 A Such an assertion was not made by Dr. Chen,
8 so my opinion does not express that positively or
9 negatively.

10 Q You do agree, though, that by 2019, a
11 POSITA would have been able to implement
12 equalization in retimer circuits in an active cable,
13 correct?

14 A Again, I've not expressed that opinion, and
15 I don't have an example in mind.

16 Q Do you disagree that a POSITA, by 2019,
17 would have been able to employ equalization in
18 circuits that retime signals in an active cable?

19 A I don't see that assertion in Dr. Chen's
20 declaration, and I have not expressed that opinion.

21 Q Do you disagree that by 2019, a POSITA
22 would have been able to place active silicon in the
23 active plugs of an active electric cable?

24 A No.

25 Q Do you disagree that by 2019, a POSITA

1 would have been able to deliver power to the
2 components inside the active plugs of an active
3 electric cable?

4 A No.

5 Q Do you disagree that a POSITA would have
6 known how to physically integrate a retimer into an
7 active electric cable?

8 A I've not seen Dr. Chen express that
9 opinion, and my opinion is in response to his
10 opinion, and I don't have an example in mind of
11 that.

12 Q So you have not expressed an opinion --

13 A In response to Dr. Chen.

14 Q So you haven't expressed an opinion one way
15 or the other about whether a POSITA would have known
16 how to physically integrate a retimer into a cable?

17 A I've not expressed that opinion one way or
18 the other.

19 Q And you have no opinion one way or the
20 other about whether a POSITA would have known how to
21 implement equalization in a retimer circuit inside
22 an active cable?

23 A Same answer.

24 Q You have not expressed an opinion one way
25 or the other about whether a POSITA would have known

1 how to deliver power to a retimer circuit inside an
2 active cable plug?

3 A Yes, I have an opinion. Yes, that -- that
4 is possible in 2019.

5 Q Have you ever heard of Thunderbolt?

6 A Yes.

7 Q What is Thunderbolt?

8 A It's a high-speed wireless -- or high-speed
9 communication standard, really developed by Apple,
10 for communications in computer-to-computer
11 communications.

12 Q And I think you mentioned "wireless" there,
13 but that --

14 A I misspoke.

15 Q Okay.

16 A It's wired.

17 Q Okay. Ethernet and Thunderbolt would be
18 different standards?

19 A Yes.

20 Q And in your opinion, because Cornelius
21 teaches a Thunderbolt cable, Cornelius cannot be
22 configured to communicate data using Ethernet; is
23 that fair?

24 A Yes.

25 Q And then, conversely, a cable that supports

1 Ethernet would not be able to be configured to
2 communicate data using Thunderbolt; is that fair?

3 A Yes.

4 Q I think earlier, when we talked about
5 backplanes, we talked about PCBs briefly. What is a
6 PCB?

7 A It's a -- PCB stands for printed circuit
8 board. It is a technology to incorporate a
9 non-conductive layer sandwiched between conductive
10 layers of traces and, potentially, connectors for
11 carrying electrical signals between physical points
12 in space.

13 Q And "PCB" is a term of art that -- people
14 know that PCB stands for printed circuit board; is
15 that fair?

16 A As I just said, yeah, uh-huh.

17 Q Is it your opinion that Samaan is directed
18 to PCB signals?

19 A Yes.

20 Q Is it your opinion that Samaan teaches
21 equalization for PCB traces?

22 A [Reviewing.]

23 Can I have the question again, please?

24 Q Is it your opinion that Samaan teaches
25 equalization for PCB traces?

1 A Yes.

2 Q Is it your opinion that Samaan teaches
3 Ethernet for PCB traces?

4 A No.

5 Q Is it your opinion that Samaan teaches
6 Ethernet at all?

7 Withdrawn. Let me rephrase.

8 Does Samaan teach Ethernet?

9 A Across the backplane? No.

10 Q If you could turn to your declaration,
11 paragraph 68.

12 Well, actually, wait. Let me -- let me
13 back up one moment.

14 Does Samaan teach Ethernet in any context?

15 A As I recall, Samaan just talks about you
16 can reach Ethernet by adding a card into the
17 backplane, a PCIe card.

18 Q And that's the only disclosure of Ethernet
19 in Samaan?

20 A As I recall, yes.

21 Q Okay. So let's go to paragraph 68, then,
22 of your declaration.

23 A Yes.

24 Q Okay. In this paragraph, you discuss
25 Samaan, and you say -- you explain that "Samaan

1 further teaches that the FSM may 'continue to
2 train'" -- and you go on.

3 So, I guess, as a first question -- okay.
4 So finite state machine is abbreviated as FSM in
5 Samaan, correct?

6 A Yes.

7 Q So --

8 A That's a common term.

9 Q -- what is a -- what is a finite state
10 machine?

11 A It's a controller. It has -- it's
12 essentially -- you can -- you can think of it today
13 as a computer with a finite set of states. It just
14 transitions between those states based on certain
15 inputs.

16 Q So you say that "Samaan further teaches
17 that the FSM may 'continue to train [the
18 equalization] throughout operation, depending on the
19 sophistication of the design.'"

20 Do you see that discussion?

21 A I do.

22 Q So what does -- what does that mean?

23 A "This passage confirms that in Samaan's
24 retimer architecture, CTLE and DFE parameters are
25 under active management by a state machine - not

1 fixed at manufacturing."

2 Q But why does this training by the FSM
3 depend on the sophistication of the design?

4 A Well, as Samaan says in paragraph 221, "The
5 finite state machine also helps locate the best
6 position to sample the eye. It is usually
7 programmable through firmware..., in order to
8 optimize the CDR's performance."

9 And then it goes on to say, "The FSM may
10 choose to train equalization upon startup then
11 freeze it, or continue to train throughout
12 operation, depending on the sophistication of the
13 design."

14 In other words, the intelligence of the
15 finite state machine is a factor in whether it is
16 freezing the equalization or continuing to train the
17 equalization.

18 Q Would it take a more sophisticated design
19 to freeze or to continue to train throughout
20 operation?

21 A Train.

22 Q So using fixed equalization parameters
23 would be a simpler design, correct?

24 MR. DAMARIO: Object to form.

25 THE WITNESS: Could be. It's not

1 disclosed, but could be.

2 BY MR. LIANG:

3 Q If we turn to paragraph 69 of your
4 declaration, one paragraph after where we were just
5 at. Let me know when you get there.

6 A Yes.

7 Q Now, this paragraph relates to link
8 training, correct?

9 A Yes.

10 Q Okay. And here, you explain that "Samaan
11 explains that the host" -- for PCIe 3.0, "the host
12 and end device each request TxEQ adjustments from
13 the other agents during Phase 2 and 3...'to allow
14 both agents to adjust the link partner's TxEQ....'"

15 Do you see that?

16 A Yes.

17 Q Okay. TxEQ stands for transmitter
18 equalization, correct?

19 A It does.

20 Q In link training, the host and end device
21 each requests transmitter equalization adjustments
22 from each other, correct?

23 A That's my understanding.

24 Q And then the intent of adaptation is to
25 allow devices on both ends of a link to adjust the

1 link partner's transmitter equalization to an
2 optimal values, correct?

3 A Yes.

4 Q So for adaptive equalization, the devices
5 on both sides of a link engage in the link training
6 algorithm, correct?

7 A Through the use of a training frame.

8 Q And what is a training frame?

9 A It's a set of data -- it's a frame that's
10 known a priori to both ends.

11 Q So the devices have to share a protocol
12 that allows them to communicate equalization
13 adjustments to each other, correct?

14 A To request transmission of a particular
15 training frame and then adjust based on the results
16 of that training frame. So there's a protocol of --
17 there's a loop protocol; transmission, measurement,
18 adaption, correction.

19 Q So I'm going to hand you an exhibit that's
20 been marked as 1058.

21 MR. LIANG: If you can -- could you stamp
22 that, please.

23 (Exhibit 1058 marked for identification.)

24 BY MR. LIANG:

25 Q Take a moment to review it and let me know

1 when you're ready for questions.

2 A I'm ready.

3 Q Okay. So Exhibit 1058 is an Information
4 Disclosure Statement, correct?

5 A Yes.

6 Q Okay. And you see how -- and in
7 particular, it's an Information Disclosure Statement
8 for the patent application that became the prior art
9 reference we've been discussing as Cornelius,
10 correct?

11 A Yes, that's my assumption.

12 Q So in Exhibit 1058, there are a number of
13 references listed.

14 Do you see that?

15 A Yes.

16 Q And if we go to the -- you see how the
17 references are numbered, citation -- cite number,
18 and it starts at 1 and goes onward?

19 Do you see that?

20 A Yes, I do.

21 Q If you could turn to page 3 of Exhibit 1058
22 and look at the reference marked citation for 61.

23 Do you see that?

24 A Yes.

25 Q Okay. And what is disclosed in citation

1 number 61?

2 A A Wikipedia page.

3 Q For what?

4 A Or pages.

5 Q And what is the Wikipedia page for?

6 A Ostensibly, Ethernet.

7 Q Have you ever used Wikipedia before?

8 A Yes.

9 (Exhibit 1056 marked for identification.)

10 BY MR. LIANG:

11 Q I'm handing you what has been marked as
12 Exhibit 1056. And Exhibit 1056 is the Wikipedia
13 page for Ethernet, correct?

14 A I'll take your representation that this is
15 the same disclosure.

16 Q And Wikipedia was widely used around the
17 world in 2019, right?

18 A Correct. Doesn't mean it's authoritative.

19 Q And Exhibit 1056 does, in fact, describe
20 Ethernet, correct?

21 A Ostensibly. That doesn't mean it's
22 authoritative.

23 Q If we could go back to Exhibit 1058 and
24 look at another entry, this time number 42, which is
25 on the first page.

1 A Yes.

2 Q Okay. So entry number 42 cites to US
3 Patent Application 2009-0003361, correct?

4 A It does.

5 (Exhibit 1060 marked for identification.)

6 BY MR. LIANG:

7 Q Okay. I'm handing you what's been marked
8 as Exhibit 1060. Exhibit 1060 is US Patent
9 Publication Number US 2009/0003361, correct?

10 A Yes.

11 Q Now, Exhibit 1060 describes a
12 "Multi-Protocol Controller That Supports PCIE [sic],
13 SAS and Enhanced Ethernet," correct?

14 A You read the title. That's what the title
15 says.

16 Q And have you ever heard of Emulex?

17 A Yes.

18 Q What is Emulex?

19 A They're a manufacturer of cables.

20 Q And --

21 A Sorry. Cables and controllers.

22 Q And Exhibit 1060 is an Emulex patent
23 application related to a controller for Ethernet,
24 among other things, correct?

25 A Ostensibly, according to the title.

1 Q Okay. So if we could go back and look at
2 Exhibit 1058.

3 A Yes.

4 Q And look at entry number 14. Do you see
5 this? Entry number 14 cites to US Patent Number
6 7,480,303.

7 Do you see that?

8 A I do.

9 (Exhibit 1061 marked for identification.)

10 BY MR. LIANG:

11 Q So I am handing you what has been marked as
12 Exhibit 1061. Take a look and let me know when
13 you're ready for questions.

14 A I'm ready.

15 Q Okay. And Exhibit 1061 is US Patent Number
16 7,480,303, correct?

17 A It is.

18 Q And this is a patent from a company called
19 Pericom Semiconductor Corp. Have you ever heard of
20 Pericom?

21 A Don't recall.

22 Q Okay. If you look at -- if you look at the
23 title, the '303 patent relates to a pseudo-Ethernet
24 switch without MACs that copies Ethernet context
25 registers between PCIe ports, correct?

1 A No. It's a "Pseudo-Ethernet Switch Without
2 Ethernet Media-Access-Controllers (MAC'S) That
3 Copies Ethernet Context Registers Between
4 PCI-Express Ports."

5 Q If we look at Figure 2.

6 A Yes.

7 Q Figure 2 describes a number of blades, each
8 with an Ethernet NIC connected to an Ethernet
9 switch, correct?

10 A It's just a block diagram, but that's --
11 those are the words on the diagram.

12 Q Okay. So I'd like to go back to
13 Exhibit 1058, the Information Disclosure Statement,
14 and this time look at entry citation number 37.
15 Citation number 37 cites to US 2008-0117909,
16 correct?

17 A Correct.

18 (Exhibit 1062 marked for identification.)

19 BY MR. LIANG:

20 Q Okay. So I'm handing you what's been
21 marked as Exhibit 1062. Exhibit 1062 is US Patent
22 Publication Number 2008/0117909, correct?

23 A Correct.

24 Q And this is a patent publication from
25 Intel, correct?

1 A The inventor is Erik Johnson, and
2 apparently, he was employed by Intel.

3 Q And if you can turn to -- if you can turn
4 to Figure 1, do you see how there are two network
5 interface controllers, which are abbreviated as
6 NICs, N-I-C?

7 Do you see that?

8 A I do.

9 Q Those NICs could be Ethernet NICs, correct?

10 A [Reviewing.]

11 That's not disclosed in the write-up of
12 the Exhibit 1062. What's disclosed is the use of an
13 802.1 MAC.

14 Q If you -- if you look at paragraph 27, it
15 discloses, "Each virtualized NIC, 112 and 114, may
16 operate at the data link layer defined in the Open
17 Systems Interface (OSI) reference model. Data link
18 layer protocols include Ethernet...."

19 Do you see that?

20 A Yes, but it doesn't really teach the use of
21 this NIC as -- this virtualized NIC as an Ethernet
22 protocol-compatible network interface. It just says
23 it's 802.1 compatible.

24 Q So you disagree that --

25 A And, again, we're talking about PCIe, which

1 is not even close to an active cable. So the
2 technology is not even close.

3 Q So you disagree that in Exhibit 1062, the
4 NICs 112 and 114 may be -- may use Ethernet as the
5 data link layer protocol?

6 A Yes. Not disclosed.

7 Q Okay. So if we go back to Exhibit 1058 and
8 we look at number 45 this time, citation number 45
9 cites to US 2009-0063701.

10 Do you see that?

11 A I do.

12 MR. LIANG: If you could mark this as
13 Exhibit 1063.

14 (Exhibit 1063 marked for identification.)

15 BY MR. LIANG:

16 Q All right. So you've been handed what's
17 been marked as Exhibit 1063. If you could take a
18 look and let me know when you're ready for
19 questions.

20 A I'm ready.

21 Q Okay. So Exhibit 1063 is US Patent
22 Publication Number US 2009/0063701, correct?

23 A It is.

24 Q And the paragraph 10 -- if you could turn
25 to paragraph 10, would you agree that Exhibit 1063

1 discloses that "Data Centers generally consists of a
2 number of different types of network," including
3 "Ethernet LAN for connecting web and application
4 servers"?

5 A Is that the end of the question?

6 Q Yes.

7 A You read that correctly.

8 Q Okay. Now, if we go back to Exhibit 1058,
9 and this time, let's look at entry number 60 on
10 page 3.

11 Citation number 60 is to Dopplinger,
12 et al., and it's a paper that's titled, US IEEE --
13 "Using IEEE 1855 [sic] for synchronization of
14 network-connected devices"; is that correct?

15 A Yes.

16 MR. LIANG: So if we can mark this as
17 Exhibit 1064.

18 (Exhibit 1064 marked for identification.)

19 BY MR. LIANG:

20 Q Exhibit 1064, take a look at it. If you
21 review it, and let me know when you're ready for
22 questions.

23 A I'm ready.

24 Q Exhibit 1064 is the article cited in
25 Exhibit 1058. It's titled, "Using IEEE 1588 for

1 synchronization of network-connected devices,"
2 correct?

3 A It is. You read that correctly.

4 Q And then towards the middle of page 1,
5 Exhibit 1064 discusses the use of PTP for time
6 synchronization over Ethernet networks, correct?

7 A Sorry. Where are you reading?

8 Q So if we look towards the middle, in the
9 paragraph with the hyperlink, Exhibit 1064 is
10 describing "the advantages of incorporating...(PTP)
11 into your network," correct?

12 A That's what the words say, yes.

13 Q And one of the advantages of incorporating
14 PTP is that it offers -- if you look at the third
15 bullet -- "low-cost implementation in multicast
16 messaging networks such as Ethernet," correct?

17 A You read that correctly.

18 Q And the paragraph after the bullets,
19 Exhibits 1064 explains that "This protocol is
20 already widely adopted by test and measurement,
21 power-line management, and industrial automation
22 applications. IEEE 1588 principles are adopted to
23 synchronize clocks in networks running
24 industrialEthernet protocols such as EtherNet/IP and
25 Ethernet Powerlink"; is that correct?

1 A You read that correctly.

2 Q Okay. And if we could go back to
3 Exhibit 1058 and this time look at citation
4 number 6, which is to US Patent Number 6,798,790.
5 Is that correct?

6 A Yes.

7 (Exhibit 1065 marked for identification.)

8 BY MR. LIANG:

9 Q Okay. So I'm handing you what has been
10 marked as Exhibit 1065. So take a look. Take a
11 second to review and let me know when you're ready
12 for questions.

13 A I'm ready.

14 Q So Exhibit 1065 is US Patent Publication
15 Number 2008/0279186, correct?

16 A It is.

17 Q Now, Figure 1 -- in Figure 1, there's a
18 power converter switch connected to a router,
19 correct?

20 A "Connected to a router."

21 Yes.

22 Q And in particular, the router is connected
23 with an Ethernet cable, correct?

24 A That's what the diagram says, yes.

25 Q And if you look at Figure 2, the packet

1 converter switch includes several Ethernet ports,
2 correct?

3 A Yes. Again, this has nothing to do with
4 active cables.

5 Q But you do agree that, as we've just seen,
6 several of the references that were cited during the
7 prosecution of Cornelius relate to Ethernet,
8 correct?

9 A Not Ethernet in the application area of the
10 invention.

11 Q But they do relate to Ethernet, correct?

12 A They relate to electronics. They relate to
13 physics. They relate to life on earth. They relate
14 to a lot of things.

15 Q But you don't believe any of the references
16 cited during Cornelius' prosecution relate to
17 Ethernet?

18 A They don't help a POSITA solve the problem
19 described by the '252 patent. They just point to
20 the fact that Ethernet exists. But Ethernet exists
21 on backplanes in between particular network
22 elements.

23 (Exhibit 1059 marked for identification.)

24 BY MR. LIANG:

25 Q I'm handing you what's been marked as

1 Exhibit 1059. Let me know when you're ready for
2 questions.

3 A I am.

4 Q Exhibit 1059 is another Information
5 Disclosure Statement from the prosecution of
6 Cornelius, correct?

7 A Yes.

8 Q And if you look at citation number 8 on
9 page 1, it refers to Patent Number 2009/0037606,
10 correct?

11 A Yes.

12 (Exhibit 1066 marked for identification.)

13 BY MR. LIANG:

14 Q Okay. So I'm handing you what's been
15 marked as Exhibit 1066. Let me know when you're
16 ready for questions.

17 A I'm ready.

18 Q Exhibit 1066 is US Patent Publication
19 Number 2009/0037606, correct?

20 A Yes.

21 Q If we turn to paragraph 2, would you agree
22 that the invention of Exhibit 1066 relates generally
23 to Ethernet networks?

24 A You read that correctly.

25 Q So several of the references that are cited

1 during the prosecution of Cornelius relate to
2 Ethernet, correct?

3 A As I just said, they indicate that Ethernet
4 existed at the point of application but that -- none
5 of these references indicate to a POSITA how to
6 solve the problem of the '252 patent or provide any
7 disclosure as to methodologies.

8 MR. LIANG: Okay. I think we've reached a
9 good -- let's go off the record.

10 (Recess taken from 12:18 p.m. to 1:07 p.m.)

11 BY MR. LIANG:

12 Q Have you ever worked as a professor?

13 A I taught in the adjunct school at UT
14 Telecom, professional courses.

15 Q What kind of courses were they?

16 A They were telecommunications courses,
17 primarily for telecomm switches and switching, and
18 it was a program targeted toward working
19 professionals who wanted to get certification in
20 telecomm.

21 Q Were you a person of ordinary skill in the
22 art on March 1st, 2019?

23 A At least.

24 Q Did you at that time have at least three
25 years of experience in high-speed data

1 communications?

2 A Yes.

3 Q How many years of professional experience
4 do you have? I know it's a lot.

5 A Interestingly enough, at least to me, I
6 started my first professional job 50 years ago this
7 month, so --

8 Q Well, congratulations on the work
9 anniversary, I suppose.

10 A Yeah.

11 Q Now, we -- a lot of your professional
12 experience has been in wireless communications,
13 correct?

14 A And wireline, W-I-R-E-L-I-N-E. So both.

15 Q How many years of experience do you have in
16 wireless communications?

17 A I'd say it's about 60/40, wireless/
18 wireline.

19 Q But all of your wireless experience would
20 be irrelevant to this IPR because it deals with
21 cables, right?

22 A No. I mean, I did my first adaptive
23 equalizer in 1979. So I've been building adaptive
24 equalizers for multiple types of communication
25 channels for 47 years.

1 Q And --

2 A And the wireless communications, the radio
3 frequency part of it is just one aspect of building
4 products in wireless. You also have to build the
5 landline side of it.

6 Q Right. But the actual wireless experience
7 is a different medium, so it's -- your experience
8 there is irrelevant to this IPR. Would you agree?

9 A I disagree. Again, you have to equalize
10 the environment. You have to do clock and data
11 recovery. It's directly applicable. It's just a
12 different physical medium.

13 Q So here, this -- this IPR, we've been
14 talking a lot about active cables. And an active
15 cable would have a plug at each end and a connecting
16 cable in the middle. Would you agree?

17 A Well, the '252 talks about -- '252 is
18 limited to the medium in the middle.

19 '252 is limited to electrical conductors
20 connected between the first and second connector.
21 So it's not optical. So the reference in this case
22 that's optical really doesn't apply.

23 Q Okay. So an active cable has a plug at
24 each end and an electrical cable in the middle?

25 A With regards to the '252, yes. The active

1 Ethernet cable in the claims has a conductor between
2 the two ends of the -- of the connectors.

3 Q Before you had started working on
4 litigation matters with Credo, had you ever heard of
5 the term "AEC"?

6 A Probably.

7 Q When?

8 A Don't recall. I hear a lot of terms.

9 Q What does AEC stand for?

10 A Adaptive electronic communications.

11 Q Have you -- withdrawn. Let me start over.

12 When did you first begin working with Credo
13 as an expert?

14 A You'd have to look at my CV. It's listed
15 there.

16 Q But would it be within the last couple
17 years?

18 A Yes.

19 Q Prior to 2019, had you ever used an active
20 Ethernet cable?

21 A Yes.

22 Q When?

23 A Building networks.

24 Q And could you give me any particular
25 examples?

1 A I have a pretty sophisticated network in my
2 house, so I use -- I use active cables in that
3 routing of data around my house, for example.

4 Q What brand are those cables at your house?

5 A What brand? Don't recall.

6 Q Are those cables at your house SFP package
7 cables?

8 A Some are; some aren't.

9 Q How fast with they?

10 A 10 gig, 50 gig, 100 gig.

11 I would also say in SiBEAM, we used 50- and
12 100-gig interfaces for those machines.

13 Q So when was the first time you saw an
14 active Ethernet cable?

15 A Don't recall. Years ago.

16 Q But you -- you've been using active
17 Ethernet cables at your house since before 2019?

18 A If I have the dates correct, that's right.

19 When we did BEEcube, BEEcube was massively
20 parallel computer used in the backbone network for
21 cellular, and that -- the LAN side of that
22 connection was 100-gig interfaces, principally
23 optical.

24 Q Did -- were you using active Ethernet
25 cables by 2015?

1 A I don't recall the timing.

2 Q Do you ever recall using active Ethernet
3 cables that have a sort of purple-ish color cable?

4 A Yes.

5 Q When?

6 A Don't recall.

7 Q Do you believe that Credo invented the
8 active Ethernet cable?

9 A I have no opinion on that.

10 Q Do you believe that Credo invented the
11 active electrical cable?

12 A I have no opinion on that.

13 Q Had you ever designed an active Ethernet
14 cable prior to March 2019?

15 A I've never designed an active Ethernet
16 cable, but I have designed many, many adaptive
17 equalizers and many, many clock recovery circuits,
18 and I have built systems around conductive wire
19 interfaces. So the elements of an active cable are
20 in my background.

21 Q But your background doesn't actually
22 include the experience of designing clock and data
23 recovery or equalization or other components for the
24 specific constraints of an active Ethernet cable?

25 A The -- again, I've never designed an active

1 Ethernet cable, but the adaptive systems, the clock
2 and data recovery systems required for conductor-
3 based interfaces over cables, I have lots of
4 experience in that.

5 So did I ever put it together in the form
6 factor of an active Ethernet cable? No. But all of
7 the basic technologies, I have lots of experience in
8 that, as well as theoretical experience.

9 Q What do you mean by "theoretical
10 experience"?

11 A Ph.D. in electrical engineering.

12 Q And that would provide you with the skills
13 you need to design an active Ethernet cable?

14 A Adaptive systems, clock and data recovery,
15 data communications technologies, characterization
16 of wireline infrastructures. Those are all elements
17 that are involved.

18 Q So you agree that by 2019, a POSITA would
19 have been able to make and use an active cable that
20 includes actively powered components, correct?

21 A I've not expressed that opinion.

22 Q So you don't know one way or the other
23 whether by 2019, a POSITA would have been able to
24 make and use an active cable that includes actively
25 powered components?

1 A I've not expressed that opinion. I don't
2 see that opinion in Dr. Chen's report.

3 Q Did you presume that by 2019 a POSITA would
4 have been able to make and use an active cable that
5 includes actively powered components?

6 A I did not use that as a basis for any
7 decisions.

8 Q By 2019, a POSITA would have been able to
9 make and use an active electrical cable in a 40-
10 gigabit Ethernet server; is that fair?

11 A I've not expressed that opinion.

12 Q Did you presume that a POSITA would have
13 been able to make and use an active electrical cable
14 in 2019 in a 40-gigabit Ethernet server?

15 A That's not among my assumptions.

16 Q Prior to March 2019, would you have been
17 able to integrate retimer circuitry into a cable
18 connector housing?

19 A Calls for speculation.

20 Q Well, I'm just asking you about your own --
21 your own experience and knowledge in 2019.

22 A I don't know.

23 Q Would a POSITA in 2019 have been able to
24 include clock and data recovery circuits for
25 retiming data in active plugs?

1 A I've not expressed that opinion.

2 Q And you're not willing to say today one way
3 or the other?

4 MR. DAMARIO: Object to form.

5 THE WITNESS: I've not seen that opinion in
6 Dr. Chen's report, and my report is in response to
7 Dr. Chen.

8 BY MR. LIANG:

9 Q So you have no opinion about whether a
10 POSITA would have been able to include clock and
11 data recovery circuits for retiming data in active
12 plugs in 2019?

13 A Not that I've expressed.

14 Q You have no opinion about whether a POSITA
15 in 2019 would have been able to include a
16 microcontroller to configure clock and data recovery
17 circuits in an active plug?

18 A Not that I've expressed.

19 Q Now, you mentioned before that you have
20 designed equalization filters before, right?

21 A Since 1979, yeah.

22 Q But you've never designed an equalization
23 filter for an active Ethernet cable, right?

24 A Well, again, the equalizer for a copper
25 conductor cable, I've designed plenty of those.

1 Whether it was for the specific purpose of building
2 an Ethernet cable, no.

3 Q Would you have been able to design an
4 equalization filter for an active Ethernet cable in
5 2019?

6 A I don't know.

7 MR. DAMARIO: Object to form.

8 BY MR. LIANG:

9 Q How would a POSITA have programmed
10 equalization on a DSP?

11 A Don't understand the question.

12 Q Well, let me ask you this. Have you ever
13 written an equalization program for a DSP?

14 A Yes. And I've built my own custom DSPs and
15 microcoded those do equalization, as well as
16 industry standard DSPs, as well as benchmark
17 Motorola standard DSPs against equalization tasks.

18 Q So how would a POSITA have used a DSP to
19 perform equalization?

20 MR. DAMARIO: Object to form.

21 THE WITNESS: Don't understand the
22 question. There's many different techniques.

23 BY MR. LIANG:

24 Q Can you give me an example of a technique
25 that a POSITA would have used to implement

1 equalization on a DSP?

2 A Write software to perform the algorithm for
3 adaption and implement the filtering required for
4 equalization.

5 Q Can you walk me through that? What exactly
6 does it look like in terms of implementing the
7 filtering required for equalization?

8 A Delay stages, tap coefficients, and
9 feedback loops, and then summation for the output.

10 Q And so how are delay stages, tap
11 coefficients, and feedback loops used to create a
12 filter for equalization?

13 A A digital filter -- a digital filter
14 implements a particular transfer function in the
15 frequency domain, and that transfer function, when
16 applied to an inbound signal, imposes frequency
17 correction to that inbound signal.

18 Q And how do tap coefficients relate to delay
19 stages in the digital filter that you're describing?

20 A Typically, one to one. Sometimes not.

21 Q So the tap coefficients would be multiplied
22 by the delay stages and then added together?

23 A Yes. The contents of the delay stages.

24 Q Have you ever heard of something called an
25 FIR filter?

1 A That's what we're discussing right now.

2 Q Okay. So a common way to implement
3 equalization on a DSP would be to use an FIR filter;
4 is that fair?

5 A Well, I think you're misusing your terms
6 there.

7 Implementing an FIR filter on an industry
8 standard programmable digital signal processor
9 involves the use of software that is compiled to a
10 set of instructions that cause the instruction
11 registers of the DSP to manipulate the sample data
12 in a particular fashion in order to implement the
13 FIR filtering operation.

14 Q So how does adaptive equalization work with
15 respect to an FIR filter?

16 A The tap coefficients are adapted in order
17 to minimize or maximize some criteria that is
18 involved in the feedback circuitry of the design.

19 Q For equalization using fixed parameters,
20 the coefficients would be loaded from memory and
21 then remain unchanged, correct?

22 A They could be.

23 Q Are you suggesting that equalization using
24 fixed parameters could have coefficients that
25 change?

1 A No. I think you're drawing a distinction
2 between general purpose memory and registers within
3 the architecture of the machine. So if you're not,
4 please clarify.

5 Q Okay. So for equalization using fixed
6 parameters, coefficients would be loaded from memory
7 into registers; because it's fixed, the coefficients
8 in the registers would remain unchanged?

9 A In some architectures, yes. The key aspect
10 is that that coefficient does not change during
11 operation. How it got into that register or that
12 memory location, depending on architecture, is a
13 different subject.

14 Q And adaptive equalization would require
15 additional code that changes the parameters to
16 minimize or maximize particular characteristics?

17 A Additional code over the filter code?

18 Q Correct.

19 A Yes, correct. Or hardware. Hardware can
20 do it, too. Depends on the machine.

21 Q Prior to March 2019, a POSITA would have
22 been able to configure equalization parameters for a
23 retimer embedded within an active electric cable,
24 correct?

25 A Don't understand the question.

1 Q Prior to March 2019, a POSITA would have
2 been able to configure equalization parameters for a
3 retimer embedded within an active electric cable,
4 correct?

5 A You just repeated the question. I don't
6 understand the question.

7 Q What don't you understand about the
8 question?

9 A Are you assuming that the cable exists?

10 Q Right. So active electrical cables existed
11 prior to March 2019, right?

12 A Yes.

13 Q And so -- and prior to March 2019, a POSITA
14 would have been able to configure equalization
15 parameters for a retimer that is embedded within an
16 active electric cable, right?

17 A In what fashion? By what mechanism? Under
18 what control? Under what architecture cable?

19 Q Do you believe that there are --

20 A I mean, your question has so many openings.

21 Q But do you believe there are any
22 circumstances in which a POSITA would have been able
23 to configure equalization parameters for a retimer
24 embedded within an active electric cable?

25 A You asked the same question again. Don't

1 know. You have to be more specific with your
2 question.

3 Q By March 2019, a POSITA would have been
4 able to configure a cable to adapt to new hosts and
5 devices, correct?

6 MR. DAMARIO: Object to form.

7 THE WITNESS: What cable? Using what
8 mechanism? Using what capability? Using what
9 architecture?

10 BY MR. LIANG:

11 Q Let's talk about --

12 A Your question is very wide open.

13 Q Let's talk about Cornelius' cable, for
14 example. Cornelius teaches a Thunderbolt cable,
15 correct?

16 A Yes.

17 Q So by 2019, a POSITA would have been able
18 to configure Cornelius' cable to adapt to new hosts
19 of devices, correct?

20 A I don't see any disclosure how that would
21 occur in Cornelius.

22 Q A POSITA would have been able to include a
23 microcontroller with Cornelius' cable to configure
24 clock and data recovery circuits in the active
25 plugs, right?

1 A Not necessarily.

2 Q Why not?

3 A I don't see any examples of it. I don't
4 see any statements by Dr. Chen about that.

5 Q By 2019, a POSITA would have been able to
6 set operational parameters, modes, or other aspects
7 and characteristics of Cornelius' plug circuitry,
8 right?

9 MR. DAMARIO: Object to form.

10 THE WITNESS: I don't see any disclosure of
11 that in Cornelius.

12 BY MR. LIANG:

13 Q By 2019, a POSITA would have been able to
14 design Cornelius' active cable to communicate with
15 the remote plug on the far end. Would you agree
16 with that?

17 MR. DAMARIO: Object to form.

18 THE WITNESS: You mean, given the
19 disclosure of Cornelius, could a POSITA implement
20 the claimed invention? Yes.

21 BY MR. LIANG:

22 Q Prior to March 2019, would a POSITA have
23 been able to account for the thermal power and
24 mechanical constraints of placing active silicon
25 within a cable assembly in an active electric cable?

1 MR. DAMARIO: Object to form.

2 THE WITNESS: I see no examples of that.

3 BY MR. LIANG:

4 Q So a POSITA would not have been able to
5 have circuitry in the plugs of an active cable that
6 is powered by one or both of the devices connected
7 by the cable?

8 MR. DAMARIO: Object to form.

9 THE WITNESS: I've not expressed that
10 opinion.

11 BY MR. LIANG:

12 Q A POSITA would have been able to isolate
13 signal paths with -- as necessary for an active
14 electric cable, right?

15 MR. DAMARIO: Object to form.

16 THE WITNESS: "Isolate signal paths." What
17 do you mean?

18 BY MR. LIANG:

19 Q Let me ask a different question.

20 By March 2019, would a POSITA have been
21 able to account for the package materials that are
22 suitable for electric -- electronic and computer
23 interfaces, such as plastic, metal, or a composite
24 material?

25 MR. DAMARIO: Object to form.

1 THE WITNESS: Don't understand the
2 question.

3 BY MR. LIANG:

4 Q So active cables have existed for quite
5 some time. Would you agree with that?

6 MR. DAMARIO: Object to form.

7 THE WITNESS: They've existed for some
8 time.

9 BY MR. LIANG:

10 Q So by 2019, a POSITA would have been able
11 to make an input port configured to mechanically and
12 electrically connect in a reasonable fashion to a
13 corresponding port?

14 MR. DAMARIO: Object to form.

15 THE WITNESS: Don't understand the
16 question.

17 BY MR. LIANG:

18 Q By 2019, a POSITA would have been able to
19 make and use a cable with retimers in a QSFP
20 interface or a pluggable module, correct?

21 MR. DAMARIO: Object to form.

22 THE WITNESS: I've not expressed that
23 opinion.

24 BY MR. LIANG:

25 Q By 2019, a POSITA would have been able to

1 make and use a cable with retimers in an SFP+
2 interface, correct?

3 MR. DAMARIO: Object to form.

4 THE WITNESS: I've not expressed that
5 opinion.

6 BY MR. LIANG:

7 Q So you don't have an opinion one way or the
8 other about whether a POSITA would have been able to
9 make and use a cable with retimers in QSFP or SFP+
10 interfaces by 2019?

11 MR. DAMARIO: Object to form.

12 THE WITNESS: Not that I've expressed.

13 BY MR. LIANG:

14 Q Would -- do you have an opinion about
15 whether a POSITA would have been able to make and
16 use a cable including -- wait. Withdrawn. Let me
17 back up.

18 Earlier, you were telling me that you have
19 used cables in your house -- active Ethernet cables
20 in your house with -- that use SFP modules from
21 before 2019, correct?

22 MR. DAMARIO: Object to form.

23 THE WITNESS: Don't recall the timing, but
24 that's my general understanding.

25 BY MR. LIANG:

1 Q I believe earlier -- well, let me ask you.

2 Had you used in your home network active Ethernet
3 cables before 2019?

4 A I believe so, but I don't know the exact
5 timing.

6 Q Some of those cables were SFP packages,
7 right?

8 A Yes.

9 Q And some of those cables with the SFP
10 packages had retimers inside the SFP packages,
11 right?

12 A I assume so, but I believe those cables
13 were optical cables, not electrically conducting
14 cables.

15 Q Ah, I see. So the active Ethernet cables
16 you were talking about in your home network were
17 optical cables?

18 A Yes.

19 Q Do active Ethernet cables have PCBs inside
20 them?

21 A Don't recall.

22 Q Is claim 1 of the '252 patent directed to
23 fixed equalization over a cable or a PCB?

24 Well, let me -- withdrawn. Let me ask you
25 this way. You can turn to the '252 patent and look

1 at claim 1.

2 Let me know when you get there.

3 A I'm there.

4 Q Okay. In claim 1, do you see around -- in
5 the last paragraph, it says, "the respective
6 transceivers each employing fixed,
7 cable-independent, equalization parameters."

8 Do you see that?

9 A I do.

10 Q Okay. So are the fixed equalization
11 parameters in claim 1 used for cable or PCB
12 channels?

13 MR. DAMARIO: Object to form.

14 THE WITNESS: [Reviewing.]

15 So the claim says, "the respective
16 transceivers each employing fixed, cable-
17 independent, equalization parameters for each of:
18 the remodulation of the transmit [sic] data stream
19 as the outbound data stream."

20 So here, we're equalizing for the effects
21 of the cable before transmission of the data stream
22 on the outbound port.

23 And then "the clock and data recovery
24 performed on the electrical input signal," the
25 electrical input signal has antecedent basis back to

1 the second element in which the claim indicates that
2 the input comes from the host device.

3 So it's clock and data recovery performed
4 on the -- from -- on data received from the host
5 device and remodulation of data for the transmit on
6 the outbound.

7 BY MR. LIANG:

8 Q During any of our breaks today, did you
9 ever discuss anything related to your testimony
10 today with your counsel?

11 A No.

12 Q During any of our breaks today, did you
13 ever discuss anything related to your testimony
14 today with anybody else?

15 A No.

16 MR. LIANG: I'll pass the witness.

17 MR. DAMARIO: I have no additional
18 questions for the witness.

19 MR. LIANG: Okay. I think we are done,
20 then.

21 THE REPORTER: Can I get transcript orders
22 for the record?

23 MR. LIANG: Yeah, I think -- I think our
24 normal thing is five days, but maybe -- given the
25 time frame, maybe we rush that for -- why don't you

1 e-mail me, and we can figure it out.

2 MR. DAMARIO: No rush on my end, and I
3 will -- I need to check with my paralegal and see
4 what she prefers. So my apologies.

5 But I can actually -- can I give you her
6 e-mail so that --

7 THE REPORTER: Sure. That would be great.
8 Do you know about a rough draft? Just because I
9 need to know tonight to --

10 MR. DAMARIO: Rough when it's ready but no
11 rush.

12 (Off the record at 1:50 p.m.)

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1 C E R T I F I C A T E

2

3 I, Debbie Leonard, Certified Shorthand
4 Reporter No. 14350 for the State of California, do
5 hereby certify:

6 That the foregoing deposition was taken
7 before me at the time and place therein set forth,
8 at which time the witness was put under oath by me;
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10 made at the time of the examination were recorded
11 stenographically by me, were thereafter transcribed
12 by me by means of computer; and that the foregoing
13 is a true record of same.

14 I further certify that I am neither counsel
15 for nor related to any party to said action, nor in
16 any way interested in the outcome thereof.

17 IN WITNESS WHEREOF, I have subscribed my
18 name this 23rd day of July, 2026.

19

20



21

Debbie Leonard, CSR, RDR, CRR
CSR NO. 14350

22

23

24

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1 Case: Marvell Semiconductor, Inc. vs Credo Technology Group Ltd.

2 Witness Name: Tim Williams, Ph.D.

3 Deposition Date: 07/16/2026

4

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8 Witness Name: Tim Williams, Ph.D.

9 Deposition Date: 07/16/2026

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1 Errata Sheet

2 NAME OF CASE: Marvell Semiconductor, Inc. vs Credo Technology Group Ltd.

3 DATE OF DEPOSITION: 07/16/2026

4 NAME OF WITNESS: Tim Williams, Ph.D.

5 Reason Codes: 1. To clarify the record.

6 2. To conform to the facts.

7 3. To correct transcription errors.

8 Page ____ Line ____ Reason ____

9 From _____ to _____

10 Page ____ Line ____ Reason ____

11 From _____ to _____

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14 Page ____ Line ____ Reason ____

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16 Page ____ Line ____ Reason ____

17 From _____ to _____

18 Page ____ Line ____ Reason ____

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25 TIM WILLIAMS, PH.D.

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