

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

MARVELL SEMICONDUCTOR, INC.,	)	
	)	
Petitioner,	)	Case No.
	)	IPR2025-01218
vs.	)	
	)	U.S. Patent No.
CREDO TECHNOLOGY GROUP,	)	10,877,233
LTD.,	)	
	)	
Patent Owner.	)	
	)	

Videotaped deposition of DR. TIM WILLIAMS, taken remotely via Zoom, before Rachel F. Gard, CSR, CCR, RPR, CRR, Notary Public, commencing at the hour of 1:00 p.m. Eastern on Friday, July 17, 2026.

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1 I N D E X

2 WITNESS PAGE

3 DR. TIM WILLIAMS

4 Cross-Examination by Ms. Zhang 4

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E X H I B I T S

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DEPOSITION EXHIBIT PAGE

8 Number 1001 U.S. Patent No. 10,877,233 7

9 Number 2020 Declaration of Tim A. 11

10 Williams

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1 (Witness sworn.)

2 WHEREUPON:

3 DR. TIM WILLIAMS

4 called as a witness herein, having been first duly
5 sworn, was examined and testified as follows:

6 CROSS-EXAMINATION

7 BY MS. ZHANG:

8 Q So, Dr. Williams, I am going to start with
9 some deposition ground rules. I understand you
10 have been taking depositions many times. But do
11 you understand that you are testifying under oath
12 today?

13 A I do.

14 Q Do you understand that the court reporter
15 is transcribing everything that is said over the
16 Zoom today?

17 A I do.

18 Q Do you understand that it is important for
19 you to give a verbal response to my questions,
20 rather than just nodding or shaking your head so
21 that the court reporter can accurately capture
22 your answers?

1 A Yes.

2 Q If at any point you do not understand a
3 question I ask, will you let me know so that I can
4 rephrase it?

5 A Yes.

6 Q If you answer a question, I will assume
7 that you understood it.

8 Is that fair?

9 A Yes.

10 Q If you need a break at any time, please
11 let me know and we can arrange a break, as long as
12 there's no question pending.

13 Do you understand?

14 A I do.

15 Q And do you understand that you cannot
16 discuss your testimony with your counsel during
17 any break?

18 A That's my understanding.

19 Q Is there any reason, medical, physical, or
20 otherwise, that might affect your ability to give
21 full and accurate testimony today?

22 A No.

1 Q Do you understand that your counsel may
2 object to certain questions during the deposition;
3 but unless your counsel instruct you not to
4 answer, you are still required to answer my
5 question?

6 A Yes.

7 Q Do you have any documents with you today,
8 whether physical or electronic?

9 A With me, on my computer, yes, of course.

10 Q Do you understand that you should not
11 browse anything on the computer during the
12 deposition, including during breaks?

13 A Yes.

14 Q Okay. So when were you first contacted
15 about this matter?

16 A Don't recall.

17 Q Maybe do you have a -- do you have a range
18 of time range?

19 A The first or second quarter of this year.

20 Q Okay. Then do you remember, when did you
21 start working on this matter?

22 A Right after I was contacted.

1 Q Prior to being retained by Credo, had you
2 ever heard of Credo?

3 A Yes.

4 Q Under what context?

5 A I was involved in a previous Credo
6 litigation versus Amphanol.

7 Q Okay. Were you familiar with any of
8 Credo's products, technologies, or patent
9 portfolio?

10 A At what time?

11 Q Before -- before you were retained by this
12 matter.

13 A Don't recall.

14 Q So I am going to upload -- I'm going to
15 upload an exhibit to the chat box.

16 (Exhibit Number 1001 for
17 identification.)

18 Q Are you able to see that?

19 A Yes, I am.

20 Q So this exhibit is the U.S. Patent No.
21 10,77,233 [sic].

22 Do you see that?

1 A Not yet. Can I have the question again,
2 please?

3 Q Do you see the document that I just
4 uploaded to the chat box?

5 A Yes.

6 Q So this is a patent, U.S. Patent
7 No. 10,77,233 [sic], correct?

8 A No.

9 Q No?

10 A No. It is U.S. Patent 10,877,233.

11 Q Okay. And I will refer this as the '233
12 patent. Will you understand?

13 A Yes.

14 Q So I am going to use a term "POSITA" to
15 refer a person of ordinary skill in the art of the
16 '233 patent as of June 21st, 2019. Do you
17 understand? Do you understand this term "POSITA"?

18 A I do.

19 Q So in total, how much time have you spent
20 reading and reviewing the '233 patent?

21 A Don't recall.

22 Q Can you tell us maybe a guess, a range?

1 A I don't recall.

2 Q And do you believe you fully understand
3 the disclosure set forth in the '233 patent?

4 A Well, in 20 years of dealing with patents,
5 I've discovered that you always learn new things
6 every time you read a patent. So "fully" is kind
7 of an extensive term. I understand the patent.

8 Q So is that -- does that mean you -- that's
9 a no? I'm asking do you fully understand the
10 disclosures set forth in the '233 patent, and my
11 understanding is that is there anything you don't
12 understand about the '233 patent?

13 A That's a negative question. I can't
14 answer that. And the use of the word "fully" is
15 objectionable. I understand the patent enough to
16 testify about it.

17 Q So, Dr. Williams, sitting here right now,
18 can you let me know if there's anything you don't
19 understand about the '233 patent?

20 A Well, if I knew what I didn't understand,
21 I would be able to understand it. So that's a
22 negative question. I can't answer that question.

1 Q Then do you have a good understanding of
2 the '233 patent's specification, figures, and the
3 claims? Is there anything you don't understand
4 about any of the figures, specification, or
5 claims?

6 A Again, if I knew what I didn't understand,
7 then I would correct it. So I can't answer your
8 question.

9 Q So does any of the -- when you say don't
10 fully understand the disclosure of the '233
11 patent, does that affect you providing your
12 opinion of your declaration?

13 A That is not --

14 MR. DaMARIO: Object to form.

15 A That is not my testimony.

16 Q Now, is there any portion of the '233
17 patent that you find unclear, ambiguous, or
18 difficult to interpret?

19 A Not at this time.

20 Q Have you ever seen, reviewed, or
21 encountered the '233 patent prior to being
22 retained in connection with this matter?

1 A I don't recall. This patent may have been
2 involved in the Amphanol case.

3 Q You're saying may have, right?

4 A Yes. I don't recall whether it was or
5 not.

6 Q Okay. So I am going to upload another
7 exhibit. Let me know when you see the exhibit I
8 just uploaded.

9 (Exhibit Number 2020 for
10 identification.)

11 A Okay. I have it.

12 Q Is this your declaration for the '233
13 patent?

14 A It is.

15 Q Is there any -- are there any errors in
16 the declaration or anything that you want to
17 change?

18 A Not at this time.

19 Q How much time did you spend preparing this
20 declaration?

21 A Don't recall.

22 Q Did you review any materials other than

1 the exhibit list listed in your declaration?

2 A Not that I recall. In connection with
3 this, creating this document, not that I recall.

4 Q Can you briefly describe the drafting
5 process of your declaration?

6 A I read the materials, created the outline
7 and first draft, and then coordinated with the
8 attorneys to finish the document.

9 Q Other than the counsel for Credo, did you
10 meet with anyone else in preparation for the
11 declaration?

12 A No.

13 Q Okay. How much time did you spend
14 preparing for today's deposition?

15 A About 10 hours.

16 Q Did you discuss with your counsel to
17 prepare for the deposition?

18 A I did.

19 Q Other than the counsel for Credo, did you
20 meet with anyone else to prepare for the
21 deposition?

22 A No.

1 Q Okay. You passed the patent bar in 2002;
2 is that correct?

3 A I did.

4 Q Are you a registered patent agent?

5 A Yes.

6 Q And are you familiar with MPEP?

7 A Yes. At least at the time I stood for my
8 exam.

9 Q What is it?

10 A What is what?

11 Q What is MPEP?

12 A It's the Manual of Patent Examination
13 Procedures used by the examiners in the Patent
14 Office.

15 Q Explain to me under Section 103 what is
16 required for a prior art reference to render a
17 claim obvious?

18 MR. DaMARIO: Object to form.

19 A I discuss it in my report, Exhibit 2020,
20 in paragraphs 25 through 35.

21 Q Can you briefly explain it here?

22 A I think my declaration accurately outlines

1 it, my understanding.

2 Q You are a registered patent agent, so are
3 you not able to explain about what is obviousness
4 under 103 without the -- without referring to the
5 declaration?

6 MR. DaMARIO: Object to form.

7 A I'm not testifying as to the procedures in
8 the Patent Office. I'm testifying as at least one
9 of ordinary skill in the art, and the
10 considerations that I applied in creating this
11 document are outlined in the paragraphs I
12 mentioned in my report.

13 Q I am just trying to understand the
14 obviousness that you applied when you were
15 preparing the declaration. So can you explain to
16 me what's your understanding of obviousness under
17 Section 103?

18 A Well, I think --

19 MR. DaMARIO: Object to form.

20 A If you'd like me to read the paragraphs, I
21 will.

22 Q You are free to refer to the declaration.

1 A Paragraph 25: Understand that even if a
2 patent is not anticipated, it is still invalid.
3 If the differences between the claimed subject
4 matter and the prior art are such that the subject
5 matter as a whole would have been obvious at the
6 time the invention was made to a POSITA.

7 I have been informed by counsel and
8 understand that a claim is unpatentable for
9 obviousness and that obviousness may be based on a
10 combination of references.

11 I am informed by counsel and understand
12 that the combination of familiar elements
13 according to known methods is likely to be obvious
14 when it does not -- does no more than yield
15 predictable results. However, I'm informed by
16 counsel and understand that a patent claim
17 composed of several elements is not proved obvious
18 merely by demonstrating that each of its elements
19 was independently known in the prior art.

20 I'm informed by counsel and understand
21 that when a patented invention is a combination of
22 known elements, the Court determines whether there

1 was an apparent reason to combine the known
2 elements in the fashion claimed by the patent at
3 issue by considering the teachings of prior art
4 references. The effects of demands known to
5 people working in the field are present in the
6 marketplace and the background knowledge possessed
7 by a person having ordinary skill in the art.

8 I am informed by counsel and understand
9 that a patent claim composed of several
10 limitations is not proved obvious merely by
11 demonstrating that each of its limitations was
12 independently known in the prior art.

13 I am informed by counsel and understand
14 that identifying a reason these elements would be
15 combined can be important because inventions in
16 many instances rely upon building blocks long
17 since uncovered, and claimed discoveries almost of
18 necessity will be combinations of what, in some
19 sense, is already known.

20 I'm informed by counsel and understand
21 that it is improper to use hindsight in an
22 obviousness analysis and the patent's claims

1 should not be used as a roadmap.

2 I'm informed by counsel and understand
3 that an obviousness inquiry requires consideration
4 of the following factors: (1), the scope and
5 context of the prior art. (2), the differences
6 between the prior art and the claims. (3), the
7 level of ordinary skill in the art. And (4), any
8 so-called secondary considerations of
9 nonobviousness, which include, (i), long-felt need
10 for the claimed invention, (ii), commercial
11 success attributable to the claimed invention,
12 (iii), unexpected results of the claimed
13 invention, and (iv), copying of the claimed
14 invention by others.

15 I have been informed by counsel and
16 understand that an obviousness evaluation can be
17 based on a single reference or a combination of
18 multiple prior art references. I understand that
19 the prior art references themselves may provide a
20 suggestion, motivation, or reason to combine but
21 that the nexus linking two or more prior art
22 references is sometimes simple common sense.

1 I've been informed by counsel and
2 understand that obviousness analysis recognizes
3 that market demand, rather than scientific
4 literature, often drives innovation and that a
5 motivation to combine references may be supplied
6 by the direction of the marketplace.

7 I have been informed by counsel and
8 understand that if a technique has been used to
9 improve one device, that a person of ordinary
10 skill at the time of the invention would recognize
11 it would improve similar devices in the same way
12 using the technique as obvious unless its
13 application is beyond his or her skill.

14 I have been informed by counsel and
15 understand that practical and common-sense
16 considerations should guide a proper obviousness
17 analysis because familiar items may have
18 obviousness uses beyond their primary purposes.

19 I've been informed by counsel and
20 understand that a person of ordinary skill looking
21 to overcome a problem will often be able to fit
22 together the teachings of multiple prior art

1 references.

2 I've been informed by counsel and
3 understand that obviousness analysis therefore
4 takes into account the inferences and creative
5 steps that a person of ordinary skill would have
6 employed at the time of the invention.

7 Q Let's move on to the next question.

8 When forming your opinions in this case,
9 did you apply an understanding that a person of
10 ordinary skill is also a person of ordinary
11 creativity?

12 A Yes.

13 Q When forming your opinions in the case,
14 did you apply an understanding that a motivation
15 to combine can be provided by common sense?

16 A Yes.

17 Q When forming your opinions on obviousness,
18 did you take into account inferences, creative
19 steps, common sense, and practical logic and
20 applications that a person of ordinary skill in
21 the art would employ under the circumstances?

22 A Yes.

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

5 A Yes.

6 Q When forming your opinions on obviousness
7 combination, does that require a physical
8 combination of references where you incorporate an
9 embodiment of one reference into the structure of
10 another?

11 A Physical incorporation isn't required.

12 Q When forming your opinions in this case,
13 did you apply an understanding that for reference
14 to teach away for an option, its disclosure must
15 criticize or otherwise discourage a POSITA?

16 A No. It could but doesn't necessarily have
17 to.

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

22 A Yes.

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

4 A No.

5 Q If prior art reference has one embodiment
6 that is technically more optimal than another
7 alternative, so an obviousness rationale can still
8 be based on the suboptimal embodiment. Do you
9 agree?

10 A I'm not sure I heard the question
11 correctly. Could I have the question again,
12 please?

13 Q Sure. So if a prior art reference has one
14 embodiment that is technically more optimal than
15 another alternative, do you agree that an
16 obviousness rationale can still be based on the
17 suboptimal embodiment?

18 MR. DaMARIO: I'll lodge a general
19 objection to the line of questioning. It's
20 calling for legal conclusions.

21 MS. ZHANG: We are asking Dr. Williams if
22 he applied such understanding when forming his

1 opinion in this case.

2 MR. DaMARIO: Same objection.

3 A I'm not an attorney, and I'm answering as
4 a POSITA. I'm answering based on my
5 understanding. Can I have the question again,
6 please?

7 Q If a prior art reference has one
8 embodiment that is technically more optimal than
9 another alternative embodiment, do you agree that
10 an obviousness rationale can still be based on the
11 suboptimal embodiment?

12 A Yes.

13 Q When forming your opinions in this case,
14 do you require a combination to be the preferred
15 or most desirable option in order to find a
16 motivation to combine?

17 A Preferred or most optimal what?

18 Q Option of the combination.

19 A Option of the combination or option of
20 each of the individual references?

21 Q Option of the ...

22 A Did you finish that sentence, option of

1 the?

2 Q Yeah, I'm trying to rephrase my question.

3 When forming your opinions in this case,
4 do you require a combination to be the preferred
5 or most desirable option of combination in order
6 to find a motivation to combine?

7 A It's not restricted to the most preferred.

8 Q I don't think I understand your answer.

9 A I think my answer answers your question.

10 Q So my question is --

11 A It's not required that it be preferred.

12 Q So then do you agree that just because
13 better alternatives exist in the prior art, that
14 doesn't really mean a less optimal combination is
15 irrelevant for obviousness purpose?

16 A That's my understanding.

17 Q When forming your opinion in the case, did
18 you apply the understanding that an unclaimed
19 feature cannot be the basis for finding a patent
20 to be nonobvious over prior art?

21 A An unclaimed feature of a prior art
22 reference?

1 Q I'm going to repeat my question.

2 When forming your opinion in the case, did
3 you apply the understanding that an unclaimed
4 feature, which means it's unclaimed in the -- it's
5 not in the claim, cannot be the basis for finding
6 a patent to be nonobviousness over prior art?

7 A It's not in the claim of the patent being
8 examined invalidity? I don't understand the
9 question.

10 Q So my question is that did you apply the
11 understanding that if a feature does not exist in
12 the challenged claim, that cannot be the basis for
13 finding a patent to be nonobvious over prior art?

14 A Sounds like it calls for a legal
15 conclusion --

16 Q So I'm asking -- I'm asking did you apply
17 this understanding when you --

18 A I did not finish my answer yet.

19 Q Sure.

20 A Sounds like it calls for a legal
21 conclusion. It's my understanding that validity
22 is applied to claims. So to the extent that some

1 feature is unrelated to the claim, that would be
2 unrelated to a validity analysis.

3 Q Okay. Do you agree that when a prior art
4 disclosure says something must be done, that means
5 it's required?

6 A Yes.

7 Q And do you agree when a prior art
8 disclosure says something may be done, that means
9 it's optional?

10 A Yes.

11 Q When a prior art reference says something
12 can be done, that also means it's optional?

13 A Correct.

14 MS. ZHANG: I think this is a good time
15 for us to take a break.

16 (A short break was taken.)

17 Q Can you explain to me what is nonvolatile
18 memory?

19 A It's memory that does not lose its state
20 when the power is removed.

21 Q Can you add more details to your
22 explanation? How would you explain nonvolatile

1 memory to a middle school student?

2 A Exactly what I just said.

3 Q Was nonvolatile memory commonly used in
4 the art by the year 2019?

5 A Yes.

6 Q And how --

7 A Wait, stop. The art of electrical
8 engineering? Don't understand "art."

9 Q In the field of this patent.

10 A In the field of active cables?

11 Q In the field of high-speed communication.

12 A In the field of high-speed communication.
13 High-speed communication in general, yes.

14 Q How common was nonvolatile memory? Can
15 you describe to me?

16 A How common was it? Nonvolatile memory was
17 a known technology at this time.

18 Q Was nonvolatile memory commonly used or
19 uncommonly used in 2019?

20 A In the art? In electronics? Don't
21 understand the question.

22 Q Yes. In electronics.

1 A Yes, it was.

2 Q And how long has nonvolatile memory
3 used -- been used in electronics?

4 A Been used? Decades.

5 Q Have you ever written a program to read or
6 write from a nonvolatile memory?

7 A Yes.

8 Q And what was the first time you did that?

9 A Don't recall exactly. Probably 1982, '83.

10 Q How old were you?

11 A When? How old --

12 Q The first time you wrote a program to read
13 or write for nonvolatile memory.

14 A So 1982, I would have been 28.

15 Q Is this something --

16 A I would have been, yeah, 28.

17 Q 28?

18 A Uh-huh, that's correct.

19 Q So you were 28 the first time you wrote a
20 program to read or write from nonvolatile memory,
21 correct?

22 A As I recall.

1 Q Is that something engineering students
2 will learn at college, to write a program to read
3 or write from a nonvolatile memory?

4 A Today?

5 Q By 2019.

6 A Yes.

7 Q So by the time 2019, engineering students
8 would learn at college to write or read -- write a
9 program to -- withdrawn. Actually, I'll rephrase
10 this question.

11 So by the time 2019, engineering students
12 learn at college to write programs to read or
13 write for nonvolatile memory, correct?

14 A Correct.

15 Q What are some examples of nonvolatile
16 memory?

17 A EEPROM is a primary example.

18 Q Are there any other examples?

19 A Battery backed up SRAM.

20 Q Any other example?

21 A Not that I can think of.

22 Q Is flash a type of nonvolatile memory?

1 A It is.

2 Q Do you agree that by the year 2019, a
3 common way to store data in nonvolatile memory
4 would be done by writing data into a flash memory?

5 A Yes. Flash is a variant of EEPROMs.

6 Q Can you explain to me how is nonvolatile
7 memory different from volatile memory?

8 A Again, nonvolatile memory, when the power
9 is removed, retains its state. In volatile
10 memory, when the power is removed, the state is
11 lost.

12 Q So any time when you remove power to a
13 volatile memory, any data in the memory will be
14 lost, correct?

15 A Probabilistically, it could still be
16 there. But in general, you can't rely on it still
17 being there.

18 Q Does that mean the data will be lost?

19 A It means probabilistically, the data could
20 still be there. But in general, you can't rely on
21 it actually being accurate.

22 Q Under what circumstance would you use a

1 nonvolatile memory?

2 A For what?

3 Q Let me rephrase my question.

4 Under what circumstance would nonvolatile
5 memory be preferred?

6 A When you wanted to retain the state of
7 something when the power was removed.

8 Q And then under what circumstance would
9 volatile memory be preferred?

10 A Typically there's a speed advantage in
11 volatile memory. And so if you're concerned about
12 the speed of read and write transactions, you
13 would use volatile memory.

14 Q Where would you store manufacturer
15 settings? Will you store the manufacturer
16 settings in volatile memory or nonvolatile memory?

17 A In a product that I was building in
18 general?

19 Q Yes.

20 A Nonvolatile.

21 Q And why is that?

22 A Because I want those manufacturer's

1 settings to be retained when the power is removed
2 from the product.

3 Q Can you explain to me what is
4 equalization?

5 A Equalization is a process of compensating
6 for physical impairments caused by a communication
7 channel.

8 Q Then can you explain to me what is
9 pre-equalization?

10 A Pre-equalization is equalization prior to
11 the transmission of information.

12 Q So pre-equalization compensates the
13 effects of the transmission before transmission,
14 correct?

15 A Compensates the detrimental effects of
16 transmission prior to transmission, correct.

17 Q The pre-equalization modifies a signal to
18 account for channel characters before
19 transmission; is that correct?

20 A Channel characters, yes.

21 Q Have you ever implemented equalization or
22 pre-equalization?

1 A Many, many times.

2 Q Can you describe the process for me?

3 A The process of implementation?

4 Q Yes.

5 A It depends on the product we're talking
6 about. But in general, it is design an equalizer
7 and implement it in whatever hardware and software
8 capacity you have available on the product.

9 Q What is an FIR filter?

10 A It's a finite impulse response filter.
11 It's a digital filter technology.

12 Q Can you describe its structure for me?

13 A Typically implemented with a tapped delay
14 line and coefficients deriving from each or some
15 of the elements of the tapped delay line, which
16 are multiplied by the contents of the digital
17 tapped delay line and then summed to form an
18 output.

19 Q What are the taps in the FIR filters?
20 What do they mean?

21 A They're weights of emphasis or de-emphasis
22 of the value that is contained within the tapped

1 delay line at that particular sample instant.

2 Q What are the coefficients in the FIR
3 filter? What do they mean?

4 A Same thing.

5 Q And can you explain again to me?

6 A The coefficient is the tapped weight, the
7 magnitude of the tap.

8 Q So what's the relationship between the FIR
9 filter -- between an FIR filter and equalization?

10 A FIR filters are commonly used to implement
11 equalization, and they are the mechanism by which
12 the filtering is applied to the transmit data
13 stream.

14 Q So how would you use an FIR filter to
15 perform pre-equalization -- withdrawn. Let me
16 rephrase that question.

17 How would you use an FIR filter to perform
18 equalization?

19 A I would create the filter. And on its
20 input, I would present the digital information
21 that is about to be transmitted. Its output would
22 be the information to be transmitted.

1 Q And how do the taps and coefficient values
2 affect the equalization?

3 A The taps modify the frequency components
4 of the transmit stream.

5 Q How about the coefficient values?

6 A Taps and coefficients are synonymous.

7 Q So how does coefficient values affect
8 equalization?

9 A Same answer.

10 Q And can you please repeat that for me?

11 A They modify the spectral content of the
12 transmit data stream.

13 Q So coefficients would be parameters that
14 affect equalization; is that correct?

15 A Yes.

16 Q How would you implement pre-equalization?

17 A I think I already answered that question.

18 Q So is it the same, basically the same way
19 as how you would implement equalization?

20 A I thought the previous question was
21 regarding pre-equalization? Was it not?

22 Q My previous question is coefficients,

1 would it be parameters that affect equalization?

2 A No, no, no. When we talked about how we
3 implement equalization, I believe you were asking
4 about pre-equalization? Were you not asking about
5 pre-equalization? If so, I would need to modify
6 my answer.

7 Q My previous question, how would you have
8 implemented pre-equalization?

9 A And didn't you just ask the same question?
10 Didn't you ask the same question twice?

11 Q Let's move on to the next question.

12 An FIR filter would need to run on some
13 sort of processor; is that correct?

14 A No.

15 Q Can you explain?

16 A An FIR filter can be built with many
17 different types of technologies. Someone who is
18 raised on programmable architecture, computer
19 architectures would potentially implement an FIR
20 filter using software. But there are many
21 technologies to do FIR filters.

22 Q One way to implement FIR filter would run

1 on some sort of processor; is that correct?

2 A One way, yes.

3 Q For example, like a DSP?

4 A Yes, for example.

5 Q Was it common to implement an FIR filter
6 on a DSP?

7 A In what time frame?

8 Q By the time 2019.

9 A Yes.

10 Q Is it correct that undergraduate
11 electronic engineering classes actually teach
12 students how to implement FIR filters on DSPs?

13 A That's my understanding.

14 Q To implement equalization on the DSP, a
15 POSITA would have to write -- written software to
16 implement the filtering required for equalization;
17 is that correct?

18 A Could I hear the question again?

19 Q To implement equalization on the DSP, a
20 POSITA would have written software to implement
21 the filtering required for equalization?

22 A Or use a prearranged package. I mean,

1 these things, you can just obtain these modules
2 nowadays.

3 Q There were software packages for
4 performing equalization on DSPs by the year 2019;
5 is that correct?

6 A That's my recollection.

7 Q Then to implement equalization on a DSP, a
8 POSITA would have written software to implement
9 the filtering required for equalization; is that
10 correct?

11 A They could either write it themselves or
12 they commonly use a package that --

13 Q So --

14 A -- that's the structure of the FIR.

15 Q To implement equalization on the DSP, a
16 POSITA would have written software or obtain a
17 package, software package, to implement the
18 filtering required for equalization?

19 A On a DSP, that's true. Well, let me
20 modify all previous answers saying a programmable,
21 a software programmable DSP. A DSP does not
22 necessarily have to be software programmable.

1 Q Now, if you want to implement adaptive
2 equalization, that would require additional code
3 over the filtering codes; is that correct?

4 A Yes.

5 Q Can you explain to me, what is adaptive
6 equalization?

7 A It is the process of modifying the
8 coefficients of the equalizer in order to
9 accomplish some particular criteria, either
10 minimizing or maximizing that criteria.

11 Q How would an active cable perform adaptive
12 equalization?

13 A Don't understand the question.

14 Q Which part you don't understand?

15 A What are the components of the active
16 cable? What are the capabilities of the active
17 cable? What's the architecture of the active
18 cable?

19 Q Then can you explain to me what components
20 in the active cable perform adaptive equalization
21 and how does it perform adaptive equalization?

22 A I don't understand what you mean by

1 "active cable." You need to be more specific
2 about what you're including within the definition
3 that you imply with active cable.

4 Q Can you think of any example of an active
5 electronic cable that could perform adaptive
6 equalization?

7 A In 2019?

8 Q Yes, by the time of 2019.

9 A I don't have one in mind.

10 Q You can't think of any single example of
11 how an active electrical cable could perform
12 adaptive equalization by the time of 2019?

13 MR. DaMARIO: Object to form.

14 A I don't understand your question.

15 Q Can you give me some examples -- can you
16 think of any example of active electronic cable
17 perform adaptive equalization in 2019?

18 A I don't have any in mind.

19 Q So you can't think of any example of how
20 active electric cable would perform adaptive
21 equalization by 2019?

22 MR. DaMARIO: Object to form.

1 A Again, I would need the details behind
2 your question in order to answer your question.

3 Q Do any active cables perform fixed
4 equalization?

5 A I don't have any in mind.

6 Q So no prior art would consider using fixed
7 equalization; is that correct?

8 MR. DaMARIO: Object to form.

9 A That's not my testimony.

10 Q Some prior art would consider using fixed
11 equalization; do you agree?

12 A I don't have any in mind.

13 Q Then is it your opinion that no prior art
14 would consider using fixed equalization?

15 MR. DaMARIO: Object to form.

16 A No.

17 Q So you're unwilling to discount the
18 possibility that prior art would consider use
19 fixed equalization?

20 MR. DaMARIO: Object to form.

21 A I'm not unwilling to do anything.

22 Q So you are willing to state that the prior

1 art would not use fixed equalization because it is
2 inferior?

3 MR. DaMARIO: Object to form.

4 A That's not my opinion.

5 Q Can you explain to me what is a backplane?

6 A Backplane is typically a printed circuit
7 board which has traces on it to allow for
8 interconnect of components within the system.

9 Q And how does it function differently from
10 a cable?

11 A It's an entirely different electrical
12 environment than a cable.

13 Q So is it your opinion that the teachings
14 for a backplane won't be applicable to a cable?

15 A In general, yes.

16 Q Is it your opinion that a backplane cannot
17 perform adaptive training?

18 A I've not expressed that opinion.

19 Q And do you agree that a backplane can
20 perform adaptive equalization?

21 A I've not expressed that opinion.

22 Q Does that mean you don't know one way or

1 the other whether adaptive equalization can be
2 performed on a backplane?

3 MR. DaMARIO: Object to form.

4 A It means I've not expressed an opinion
5 about this.

6 MS. ZHANG: Can we take a short break? I
7 need to grab some water.

8 THE WITNESS: Of course.

9 (A short break was taken.)

10 Q Are you aware of any active electrical
11 cable that include a controller inside the plug?

12 A Not at this time.

13 Q Is it your opinion that preset parameters
14 are different from fixed parameters?

15 A Preset parameters can be fixed, but fixed
16 parameters can be different than preset.

17 Q Is it your opinion that in the field of
18 high-speed serial communications, the term presets
19 refer to initial starting values that are loaded
20 at the commencement of operation?

21 A That's a commonly understood term, yes.

22 Q So for adaptive training -- withdraw. Let

1 me rephrase that.

2 For adaptive equalization, initial
3 starting values would be loaded into the register
4 when the cable is plugged in at the beginning of
5 operation; is that correct?

6 A They can be.

7 Q And then the initial values would be
8 adjusted during the adaptive process; is that
9 correct?

10 A They can be.

11 Q So yesterday you mentioned you have
12 50 years of professional experience; is that
13 correct?

14 A Yes.

15 Q And you estimated that over half of your
16 professional experience was directed to wireless;
17 is that correct?

18 A It's about 60/40.

19 Q Like the deposition yesterday, this case
20 here is about active electrical cables; do you
21 agree?

22 A I do.

1 Q And do you agree that over half of your
2 professional experience is irrelevant to this IPR
3 because it dealt with wireless?

4 A I do not.

5 Q Can you please elaborate on that?

6 A Wireless products interface with wired
7 products, and wireless products include equalizers
8 and clock data recovery systems. So all of my
9 experience in my 50 years of professional
10 experience in building communication systems
11 involve technologies such as adaptive
12 equalization, equalization as well as clock and
13 data recovery circuits. The wireless part is
14 irrelevant.

15 Q So do you believe that your wireless
16 experience in equalization and adaptive
17 equalization is applicable to active electrical
18 cables?

19 A No. It's applicable to adaptive systems,
20 equalization, and clock and data recovery
21 circuits. To the extent those technologies are
22 used within an active cable, then, yes, my

1 experience does directly apply.

2 MS. ZHANG: That concludes all my
3 questions now. Pass the witness.

4 MR. DaMARIO: I have no additional
5 questions. Thank you.

6 (Witness excused, 2:35 p.m. Eastern.)

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

2 I, RACHEL F. GARD, RPR, CCR, CRR, CSR No.
3 084-3324, No. 9315, No. 1010, a Certified
4 Shorthand Reporter in and for the States of
5 Illinois, Michigan, Nevada at large, do hereby
6 certify that DR. TIM WILLIAMS, the deponent
7 herein, was previously duly sworn to tell the
8 truth, the whole truth, and nothing but the truth
9 in the aforementioned matter;

10 That the foregoing deposition was taken on
11 behalf of the petitioner, on the 17th day of July,
12 2026, at 1:00 p.m. Eastern, pursuant to the
13 applicable rules;

14 That said deposition was taken down in
15 stenograph notes and afterwards reduced to
16 typewriting under my direction, and that the
17 typewritten transcript is a true record of the
18 testimony given by the said deponent; and that
19 signature was requested by the deponent and all
20 parties present;

21 That the parties were represented by their
22 counsel as aforementioned.

I do further certify that I am a disinterested
person in this cause of action, that I am not a
relative or attorney of either party or otherwise
interested in the event of this action, and that I
am not in the employ of the attorneys for any
party.

IN WITNESS WHEREOF, I have hereunto set my
hand and affixed my seal on this 24th
day of July, 2026.

19
20



21
22

COURT REPORTER

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

2 Witness Name: Tim Williams, Ph.D.

3 Deposition Date: 07/17/2026

4

5

6 Please be advised that the transcript in the above

7 referenced matter is now complete and ready for signature.

8 The deponent may come to this office to sign the transcript,

9 a copy may be purchased for the witness to review and sign,

10 or the deponent and/or counsel may waive the option of

11 signing. Please advise us of the option selected.

12 Please forward the errata sheet and the original signed

13 signature page to counsel noticing the deposition, noting the

14 applicable time period allowed for such by the governing

15 Rules of Procedure. If you have any questions, please do

16 not hesitate to call our office at (202)-232-0646.

17

18 Sincerely,

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6 SIGNATURE PAGE

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

8 Witness Name: Tim Williams, Ph.D.

9 Deposition Date: 07/17/2026

10 I do hereby acknowledge that I have read

11 and examined the foregoing pages

12 of the transcript of my deposition and that:

13 (Check appropriate box):

14 () The same is a true, correct and

15 complete transcription of the answers given by

16 me to the questions therein recorded.

17 () Except for the changes noted in the

attached Errata Sheet, the same is a true,

18 correct and complete transcription of the

answers given by me to the questions therein

19 recorded.

20 _____
DATE

WITNESS SIGNATURE

21

22 _____
DATE

NOTARY

1 Errata Sheet

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

3 DATE OF DEPOSITION: 07/17/2026

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 _____

12 Page ____ Line ____ Reason ____

13 From _____ to _____

14 Page ____ Line ____ Reason ____

15 From _____ to _____

16 Page ____ Line ____ Reason ____

17 From _____ to _____

18 Page ____ Line ____ Reason ____

19 From _____ to _____

20 Page ____ Line ____ Reason ____

21 _____

22 TIM WILLIAMS, PH.D.

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