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

- - - - - x
MEDIATEK, INC., :
Petitioner, : IPR2024-00796
v. :
PARKERVISION, INC., :
Patent Owner. :
- - - - - X

Videotaped Deposition of LAWRENCE E. LARSON, Ph.D.
Conducted Virtually
Monday, August 4, 2025
10:15 a.m. EST

Job No.: 595113
Pages 1 - 78
Reported by: Debra A. Whitehead

1 Videotaped Deposition of LAWRENCE E. LARSON,
2 Ph.D., conducted virtually.

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4
5 Pursuant to notice, before Debra Ann Whitehead,
6 E-Notary Public in and for the Commonwealth of
7 Virginia.

A P P E A R A N C E S

ON BEHALF OF PETITIONER:

EVAN S. DAY, ESQUIRE

JESSICA C. KAISER, ESQUIRE

PERKINS COIE LLP

11452 El Camino Real

Suite 300

San Diego, California 92130-2080

(858) 720-5700

ON BEHALF OF PATENT OWNER:

JASON CHARKOW, ESQUIRE

DAIGNAULT IYER LLP

8229 Boone Boulevard

Suite 450

Vienna, Virginia 22182

(929) 280-1024

ALSO PRESENT:

DON LANE, Video Specialist

CHARLOTTE FORREST, A/V Technician

C O N T E N T S

EXAMINATION OF LAWRENCE E. LARSON, Ph.D.	PAGE
By Mr. Charkow	6

EXHIBITS MARKED IN TODAY'S SESSION

(Attached to the Transcript)

LARSON EXHIBIT	PAGE
Exhibit 1 U.S. Patent No. 7,483,686	6
Exhibit 2 U.S. Patent No. 6,061,551	11

P R O C E E D I N G S

VIDEO SPECIALIST: Here begins the remote video deposition of Dr. Lawrence Larson; in the matter of MediaTek, Inc., versus ParkerVision, Inc.; pending in the United States Patent and Trademark Office; Case Number as it appears, IPR2024-00796.

Today's date is August 4, 2025. The time on the video monitor is 10:15 a.m. The remote videographer today is Don Lane, representing Planet Depos. All parties of this video deposition are attending remotely.

Would counsel please voice identify themselves and state whom they represent.

MR. CHARKOW: Jason Charkow, on behalf of ParkerVision, of the Daignault Iyer law firm.

MR. DAY: Evan Day, from Perkins Coie, on behalf of petitioner MediaTek. And I am joined by Jessica Kaiser, also from Perkins Coie.

VIDEO SPECIALIST: The court reporter today is Debbie Whitehead, representing Planet Depos.

10:15:02

10:15:05

10:15:10

10:15:10

10:15:10

1 Would the reporter please swear in the 10:15:10
2 witness. 10:15:13

3 LAWRENCE E. LARSON, Ph.D., 10:15:13
4 having been duly sworn, testified as follows: 10:15:13

5 EXAMINATION BY COUNSEL FOR PATENT OWNER 10:15:28

6 BY MR. CHARKOW: 10:15:28

7 Q All right. Can you please state your 10:15:29
8 name for the record. 10:15:31

9 A Lawrence Ernest Larson. 10:15:32

10 Q And is there any reason you can't give 10:15:33
11 truthful and accurate testimony here today? 10:15:36

12 A No, none at all. 10:15:39

13 Q All right. So the first thing -- the 10:15:40
14 first thing that I would like you to do is, if you 10:15:43
15 could open the '686 patent and put that in front 10:15:45
16 of you. Strike that. 10:15:49

17 You have been provided with Exhibit 1 to 10:15:51
18 your deposition, which is the '686 patent which is 10:15:55
19 Exhibit 1001 in the IPR. 10:15:58

20 (Larson Deposition Exhibit 1 marked for 10:15:58
21 identification and is attached to the transcript.) 10:16:01

22 Q And let me know if you have it in front 10:16:01

1	of you?	10:16:03
2	A I have it open in front of me.	10:16:07
3	Q Can you turn to Figure 64F, as in Frank,	10:16:09
4	please, which is on Page 99 of the PDF.	10:16:13
5	A I'm sorry. I'm going to rearrange my	10:16:22
6	screen a bit here so that I can see you and also	10:16:25
7	see the exhibit. So just a moment.	10:16:27
8	Would you repeat the figure number again.	10:16:46
9	I apologize.	10:16:48
10	Q 64F.	10:16:49
11	A Thank you.	10:16:51
12	Q Page 99 of the PDF.	10:17:10
13	A Yeah, I've got it. I'm sorry, it took a	10:17:12
14	while.	10:17:14
15	Q Great. So you're on -- strike that.	10:17:14
16	You see Figure 64F of the '686 patent.	10:17:18
17	Correct?	10:17:22
18	A I see it here, yes.	10:17:22
19	Q And you see that there's, it says,	10:17:24
20	Aperture.	10:17:27
21	Do you see that?	10:17:28
22	A It's Aperture 6420, if that's what you're	10:17:30

1	referring to.	10:17:36
2	Q Yes.	10:17:36
3	MR. DAY: Objection. Beyond the scope.	10:17:37
4	Q In the '686 patent an aperture is a	10:17:40
5	discrete period of time when there is a control	10:17:43
6	signal. Correct?	10:17:45
7	A Well, the aperture is --	10:17:49
8	MR. DAY: Object to form.	10:17:51
9	A -- is the period of time during which the	10:17:52
10	sampling is occurring.	10:17:56
11	Q And what do you mean, an aperture is a	10:18:00
12	period of time during which sampling is occurring?	10:18:03
13	A Well, it's, you know -- it's the -- it's	10:18:05
14	the period of time when your -- the switch -- I	10:18:08
15	guess in the '686 patent the switch is on.	10:18:13
16	Q And between the apertures is when the	10:18:17
17	switch is off. Correct?	10:18:21
18	A Between the apertures, that's when the	10:18:24
19	switch is not conducting. I think you used the	10:18:26
20	word off.	10:18:30
21	(A discussion was held off the record.)	10:18:43
22	Q So an aperture is a period of time when	10:18:43

1	there's a control signal present. Correct?	10:18:45
---	--	----------

2	MR. DAY: Object to form.	10:18:49
---	--------------------------	----------

3	A	Yeah, I mean, the -- there's a control	10:18:52
---	---	--	----------

```
4 | signal that -- and the aperture is -- the aperture 10:18:54
```

5 | is there as part of the control signal, yes. | 10:18:59

6	Q	In the context of the '686 patent	10:19:02
---	---	-----------------------------------	----------

7	transferring nonnegligible -- strike that. Strike	10:19:06
---	---	----------

8	that.	10:19:09
---	-------	----------

9	In the context of the '686 patent	10:19:09
---	-----------------------------------	----------

10	transferring nonnegligible amounts of energy	10:19:13
----	--	----------

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11 | requires the use of nonnegligible apertures. | 10:19:17
```

12	Correct?	10:19:20
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13	MR. DAY: Object to form.	10:19:23
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14	A Well, yeah, I mean, I think that the	10:19:24
----	--	----------

15	claims of the '686 don't really talk about	10:19:28
----	--	----------

16	negligible or nonnegligible amounts of energy.	10:19:30
----	--	----------

17	But I guess in the specification, that that is	10:19:35
----	--	----------

18 | discussed. And certainly the larger the aperture | 10:19:38

19 the more energy is transferred, or can be 10:19:42

20	transferred.	10:19:45
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21	Q	Right. So it's logical --	10:19:46
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22	A	So that's -- in the context of the	10:19:47
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1	specification, I think that's -- that's discussed,	10:19:48
2	yes.	10:19:50
3	Q And so what I said was correct. Right?	10:19:51
4	MR. DAY: Object to form.	10:19:56
5	A In the -- in the context of the	10:19:57
6	specification. In the context of the claims, I'm	10:19:58
7	not sure that that's -- it's just not discussed in	10:20:00
8	the claims.	10:20:02
9	Q In the context of the '686 patent you	10:20:05
10	would agree that transferring nonnegligible	10:20:08
11	amounts of energy requires a use of nonnegligible	10:20:10
12	apertures. Correct?	10:20:12
13	MR. DAY: Object to form.	10:20:14
14	A Yeah, well, you know, once again, I mean,	10:20:20
15	I think that the '686 specification talks about,	10:20:21
16	you know, connect -- transferring nonnegligible	10:20:24
17	amounts of energy using a nonnegligible aperture.	10:20:27
18	In the entire context of the patent I'm not sure	10:20:31
19	that's true, because the claims are broader than	10:20:33
20	what you said.	10:20:38
21	Q Right. Well, you can't transfer	10:20:39
22	nonnegligible amounts of energy without using	10:20:41

1	nonnegligible apertures according to the patent.	10:20:43
2	Correct? That's how the patent puts it?	10:20:46
3	A According to the --	10:20:47
4	MR. DAY: Object to form.	10:20:47
5	A According to the specification in the	10:20:48
6	patent, nonnegligible amounts of energy are	10:20:51
7	associated with nonnegligible -- nonnegligible	10:20:53
8	amounts of energy transferred are associated with	10:20:56
9	a nonnegligible aperture.	10:20:58
10	Q All right. You could put that patent	10:21:01
11	aside just for a few minutes. We're going to	10:21:05
12	switch, switch away from it now.	10:21:07
13	A Okay.	10:21:09
14	Q So you have been provided with Exhibit 2	10:21:09
15	to your deposition, which is the '551 patent which	10:21:14
16	is in the IPR is Exhibit 1008.	10:21:18
17	(Larson Deposition Exhibit 2 marked for	10:21:18
18	identification and is attached to the transcript.)	10:21:24
19	Q And if you could let me know when you	10:21:24
20	have that in front of you.	10:21:25
21	A Yes. I'm sorry, I'll let you know.	10:21:31
22	Q Yeah.	10:21:31

Transcript of Lawrence E. Larson, Ph.D.
Conducted on August 4, 2025

12

1	A	Okay, I have it in front of me.	10:21:39
2	Q	And I'll try to give you PDF numbers.	10:21:41
3		Sometimes my computer is slow and I can't get	10:21:43
4		quickly to them, so I'm going to give you Column	10:21:45
5		and line numbers. And if I can give you a PDF to	10:21:48
6		make it easier, a PDF page, I will do it. But you	10:21:51
7		may get there before I get there. Okay?	10:21:54
8	A	Okay.	10:21:56
9	Q	Okay.	10:21:56
10	A	Thank you.	10:21:57
11	Q	So -- yes. So let's go to -- strike	10:21:57
12		that.	10:22:03
13		So let's go to Column 113 of the '551	10:22:03
14		patent, and that's on PDF Page 193.	10:22:08
15	A	Did you say Column 113?	10:22:23
16	Q	Yes, I did.	10:22:24
17	A	Thank you. I just am scrolling.	10:22:26
18	Q	PDF 193.	10:22:31
19	A	Yes. I'm using my browser to look at the	10:22:33
20		PDF file, so it -- anyway, it might be a	10:22:39
21		different -- so I -- yeah, I'm at Column 113.	10:22:42
22	Q	And can you go down to Line 56.	10:22:46

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ParkerVision Exhibit 2013
MediaTek v. ParkerVision - IPR2024-00796

1	A	Yes. Let me just blow it up a bit.	10:22:53
2		Okay. I am there.	10:22:56
3	Q	So Line 56 through 58 of the '551 patent	10:22:57
4		says, An optional amplifier/filter stage or stages	10:23:04
5		10104 and 10112 may be included to provide	10:23:09
6		additional receiver sensitivity, bandwidth control	10:23:14
7		or signal conditioning for the decode circuitry	10:23:18
8		10114.	10:23:22
9		Do you see that?	10:23:22
10	A	Yes.	10:23:25
11		MR. DAY: Objection. Beyond the scope.	10:23:25
12	Q	What is your understanding of what	10:23:26
13		sensitivity means in wireless -- you know, in the	10:23:29
14		context of the patent, in the context of wireless	10:23:35
15		communications?	10:23:38
16	A	Yes, sensitivity --	10:23:40
17		MR. DAY: Object to form.	10:23:41
18	A	-- is the -- I would say the minimum	10:23:42
19		signal or minimum signal-to-noise ratio that is	10:23:48
20		required in order to accurately decode the	10:23:55
21		received signal based on a certain system	10:23:59
22		specification.	10:24:02

1	Q	And when you say, system specification,	10:24:03
2		you mean like, for example, like WiFi or	10:24:06
3		Bluetooth, would that be specifications?	10:24:09
4	A	Yes, those are --	10:24:11
5		MR. DAY: Object to form.	10:24:11
6	A	-- those are good examples.	10:24:11
7	Q	And what is bandwidth control?	10:24:15
8		MR. DAY: Object to form. And beyond the	10:24:19
9		scope.	10:24:21
10	A	Yeah, bandwidth control -- you know,	10:24:25
11		usually it's a little less precisely defined. But	10:24:29
12		generally speaking, in a wireless system the	10:24:34
13		signal has a certain bandwidth which is --	10:24:36
14		contains the information. It's basically the	10:24:48
15		information bandwidth that you're trying to	10:24:50
16		receive.	10:24:52
17		And I think the bandwidth control, you	10:24:55
18		know, basically would be controlling the bandwidth	10:24:58
19		of the -- of your system in order to accommodate	10:25:03
20		the bandwidth of the signal that you're trying to	10:25:05
21		receive.	10:25:09
22	Q	And bandwidth control relates to WiFi or	10:25:10

1	Bluetooth. Right?	10:25:13
2	MR. DAY: Object to form.	10:25:14
3	A Yeah, it would -- it would relate to any	10:25:15
4	communication system at all. WiFi and Bluetooth	10:25:21
5	are great examples.	10:25:24
6	Q And what is signal conditioning in the	10:25:25
7	context of the '686 patent and wireless	10:25:27
8	networking -- or, strike that.	10:25:31
9	MR. DAY: Object to form.	10:25:31
10	Q What is signal conditioning in the	10:25:32
11	context of the '686 patent and wireless	10:25:35
12	communications?	10:25:38
13	MR. DAY: Object to form. Beyond the	10:25:39
14	scope.	10:25:40
15	A Yeah, well, this is in the '551 patent.	10:25:42
16	But generally signal --	10:25:45
17	Q Oh, I'm sorry. Sorry. Let me withdraw	10:25:47
18	the question. Sorry. My bad.	10:25:49
19	A Okay.	10:25:51
20	Q In the context of the '551 patent and	10:25:51
21	wireless communications, what is signal	10:25:55
22	conditioning?	10:25:57

1	A	Yeah.	10:25:58
2	MR. DAY:	Same objections.	10:25:58
3	A	So signal conditioning generally refers	10:25:59
4		to the notion that you receive a signal -- let's	10:26:04
5		take a receiver as an example. You receive a	10:26:14
6		signal at the receiver input, and it's a small	10:26:21
7		signal. It has to be changed in frequency. It	10:26:23
8		has to be amplified. It has to be filtered. And	10:26:25
9		all of those actions together are generally known	10:26:29
10		as signal conditioning.	10:26:32
11		And it's basically the process of getting	10:26:34
12		that received signal to be in a -- in an	10:26:35
13		appropriate condition to be digitally processed	10:26:40
14		later on in the transceiver.	10:26:44
15	Q	And signal conditioning also relates to	10:26:47
16		WiFi and Bluetooth standards. Correct?	10:26:49
17	MR. DAY:	Object to form. Beyond the	10:26:51
18		scope.	10:26:53
19	A	Yeah. And once again, you know, any	10:26:54
20		communications, any wireless communication systems	10:26:56
21		will have signal conditioning. Bluetooth and WiFi	10:26:58
22		are examples.	10:27:01

1 Q Can you turn to Column 67 now please of 10:27:01
2 the -- still the '551 patent. 10:27:08

3 A Yes. 10:27:12

4 (Discussion held off the record with the 10:27:12
5 court reporter.) 10:27:12

6 Q Yeah, sometimes we get -- we'll just get 10:27:27
7 into a flow and it's just like the natural way 10:27:29
8 people talk. So, yeah, if you could just take a 10:27:31
9 breath, like you're going to jump into a pool or 10:27:33
10 something like that, before you say something. 10:27:35
11 And then you'll give Evan a chance to do what he 10:27:37
12 needs to do. 10:27:38

13 A Okay. 10:27:39

14 Q All right. So Column -- 10:27:39

15 A Not -- did you say Column 67? I just 10:27:41
16 want -- 10:27:42

17 Q Yes, correct. It's on PDF Page 170. 10:27:43

18 A Yes, I'm there. 10:27:46

19 Q So you're right now looking at -- so 10:27:47
20 strike that. 10:27:49

21 I would like you to look at the '551 10:27:50
22 patent, Column 67, starting at Line 14. Okay? 10:27:52

1	A	Yes, I see that.	10:27:58
2	Q	So it reads, In an energy transfer	10:28:04
3		environment the storage module illustrated in	10:28:08
4		Figure 82 as a storage capacitance 8208 preferably	10:28:10
5		has the capacity to handle the power being	10:28:15
6		transferred and to allow it to accept a	10:28:16
7		nonnegligible amount of power during a	10:28:19
8		nonnegligible aperture period.	10:28:22
9		Do you see that?	10:28:24
10	A	I do.	10:28:25
11	Q	And then the paragraph goes on to say,	10:28:26
12		This allows a storage capacitance 8208 to store	10:28:29
13		energy transferred from the input EM signal 8204	10:28:35
14		without substantial concern for accurately	10:28:38
15		reproducing the original unaffected voltage level	10:28:41
16		of the input EM signal.	10:28:45
17		Are you with me so far?	10:28:47
18	A	Yes.	10:28:51
19	Q	Okay. What does that mean in terms of	10:28:51
20		the '551 patent?	10:28:58
21		MR. DAY: Object to form, and scope.	10:29:00
22	A	Are you referring to both of those	10:29:02

1 sentences or just the second one or --

10:29:04

2 Q Yeah. In the -- well, I read them
3 together because I think the first sentence
4 provides context for the second.

10:29:06

10:29:08

10:29:10

5 So I just, I'm trying to understand what
6 it means that without -- ultimately this language,
7 without substantial concern for accurately
8 reproducing the original unaffected voltage of the
9 input EM signal.

10:29:11

10:29:13

10:29:18

10:29:20

10:29:23

10 MR. DAY: Objection. Form, and scope.

10:29:26

11 A Well, I think that that sentence is
12 saying -- I'm looking at the first sentence. It
13 says that the storage module preferably has the
14 capacity to handle the power being transferred to
15 it, and to allow it to accept a nonnegligible
16 amount of power during a nonnegligible aperture
17 period.

10:29:33

10:29:35

10:29:44

10:29:51

10:29:54

10:30:00

10:30:05

18 It seems to be implying that the
19 capacitor, the storage capacitance has to -- has
20 to be big enough to handle a certain amount of
21 power.

10:30:05

10:30:08

10:30:10

10:30:12

22 Q Okay. So what you're reading, is that --

10:30:12

1	A	Kind of the --	10:30:12
2	Q	Sorry.	10:30:16
3	A	Yeah, and I -- honestly, I don't	10:30:17
4		completely understand that, but I believe that's	10:30:19
5		what it's implying.	10:30:22
6	Q	So you believe that the '551 patent at	10:30:23
7		Column 67, Line 14 through -- it goes to 24, but	10:30:27
8		that paragraph implies that you need a certain	10:30:33
9		size capacitor to allow for nonnegligible amounts	10:30:36
10		of power during a nonnegligible period to be	10:30:45
11		stored on the capacitor. Correct?	10:30:51
12		MR. DAY: Object to form. Beyond the	10:30:54
13		scope of the reply declaration.	10:30:55
14	A	Yeah, I mean, I think that the word	10:31:03
15		handle in the first sentence is a little -- well,	10:31:04
16		it's an odd choice of words. And normally that	10:31:11
17		implies that there's some sort of -- you know,	10:31:18
18		there could be some destruction of the capacitor	10:31:21
19		because it's not large enough to handle the power,	10:31:24
20		and that's not at all what normally happens in a	10:31:27
21		wireless communication receiver. So the first	10:31:30
22		sentence is strangely worded.	10:31:33

1 And then the second sentence talks about,
2 this allows -- I'm going to read the second
3 sentence now aloud. This allows a storage
4 capacitance to store energy transferred for the EM
5 signal without substantial concern for accurately
6 reproducing the original unaffected voltage level
7 of the EM signal.

10:31:38
10:31:46
10:31:48
10:31:51
10:31:54
10:31:56
10:32:00

8 And I -- that sentence is also I think
9 strangely worded. Because I'm not sure that the
10 value of the storage capacitor is going to have,
11 honestly, any impact or any significant impact on
12 the accuracy of the original unaffected voltage
13 level from the EM signal.

10:32:02
10:32:04
10:32:07
10:32:13
10:32:19
10:32:24

14 So I -- as I said, I think that that
15 sentence is strangely worded and not even
16 necessarily consistent with the first sentence,
17 unless they're talking about some kind of
18 destructive process --

10:32:27
10:32:29
10:32:31
10:32:35
10:32:37

19 Q Right.

10:32:38

20 A -- with the power.

10:32:39

21 So I mean, I'm trying to interpret this
22 as best as I can, but it is I think strangely

10:32:41
10:32:43

1	worded.	10:32:46
2	Q Well, let's keep reading. It says, For	10:32:46
3	example, in an embodiment the storage capacitance	10:32:49
4	8208 has a value in the range of 18 picofarads.	10:32:51
5	Do you see that?	10:32:57
6	A I do see that.	10:32:58
7	Q And then it says, other suitable	10:32:58
8	capacitance values and storage modules can be	10:33:02
9	used.	10:33:03
10	Do you see that?	10:33:03
11	A Yes, I do.	10:33:08
12	Q All right. So what the -- 18 picofarads	10:33:08
13	is a pretty big capacitor. Correct?	10:33:11
14	MR. DAY: Object to form.	10:33:14
15	A Well, I mean, it's -- you know, in this,	10:33:15
16	in the context of a receiver operating at these	10:33:20
17	frequencies, that's a reasonably sized capacitor.	10:33:22
18	I'm not sure I would say it was big, but it's --	10:33:27
19	it's not trivial, either.	10:33:30
20	Q Right. So what that paragraph is	10:33:32
21	teaching -- strike that.	10:33:40
22	What the '551 patent is teaching is that,	10:33:41

1 use a larger -- you're using a large capacitor, in 10:33:44
2 this case 18 picofarad capacitor, is used to allow 10:33:48
3 for significant power to be transferred and stored 10:33:53
4 at the capacitor. Correct? 10:34:00

5 MR. DAY: Object to form. 10:34:04

6 A Well, I mean, what the paragraph actually 10:34:13
7 says is that the size of that capacitor is chosen 10:34:17
8 so that the -- so that the energy stored is 10:34:24
9 somehow related, accurately related to the 10:34:40
10 original voltage level. I mean, I think that's 10:34:42
11 kind of what it's saying there. 10:34:44

12 It's -- I mean, I'm not sure that -- I 10:34:45
13 mean, I guess the first sentence says, a 10:34:51
14 nonnegligible amount of power. But the capacitor 10:34:55
15 size is chosen in order to accurately reproduce 10:34:57
16 the voltage, according to this paragraph. It does 10:35:01
17 use the words nonnegligible power. 10:35:06

18 Q So the '551 patent is teaching a specific 10:35:09
19 size capacitor that can be used to accomplish 10:35:13
20 maintaining -- strike that. 10:35:21

21 The '551 patent is teaching a specific 10:35:23
22 capacitor size that is used to accurately 10:35:27

1	reproduce the voltage of the original RF signal.	10:35:31
2	Correct?	10:35:36
3	A I think that's what this paragraph is	10:35:36
4	implying. Yeah, that the choice of the capacitor	10:35:37
5	is done to ensure perhaps an accurate reproduction	10:35:43
6	of the original voltage level.	10:35:53
7	Q And why -- why is it important to ensure	10:35:55
8	an accurate reproduction of the original voltage	10:36:00
9	level?	10:36:02
10	MR. DAY: Object to form.	10:36:04
11	Q In the context of wireless -- in the	10:36:05
12	context of wireless communications.	10:36:07
13	MR. DAY: Object to form.	10:36:09
14	A Well, you're -- you're receiving this	10:36:13
15	signal and you're changing its frequency, but you	10:36:15
16	want to maintain the same voltage level at the --	10:36:21
17	at the output that appeared at the input, because	10:36:24
18	you want to accurately reproduce that signal but	10:36:27
19	at a lower frequency.	10:36:29
20	Q And is accurately reproducing a signal	10:36:30
21	important in wireless specifications such as WiFi	10:36:33
22	and Bluetooth?	10:36:38

1	MR. DAY: Object to form.	10:36:39
2	A Yeah, this accurate reproduction is	10:36:42
3	important to maintain the sensitivity of the	10:36:46
4	receiver, which we talked about earlier.	10:36:49
5	Q Right. And to meet the standards.	10:36:50
6	Right?	10:36:53
7	A And then the sensitivity --	10:36:53
8	MR. DAY: Object to form.	10:36:55
9	A -- specification is determined by the	10:36:56
10	standards.	10:36:59
11	Q For both WiFi and Bluetooth?	10:37:00
12	MR. DAY: Object to form.	10:37:02
13	A For all wireless communication standards,	10:37:04
14	WiFi and Bluetooth included.	10:37:06
15	Q All right. Can you turn to Paragraph 103	10:37:09
16	please of the '551 patent.	10:37:15
17	A Yes. Did you say Page 103?	10:37:19
18	Q No. I'm sorry, Column 103.	10:37:28
19	A Oh, Column. I'm sorry.	10:37:31
20	Q I misspoke.	10:37:32
21	A Yeah. Yeah.	10:37:33
22	Q Just let me know when you're there. So	10:37:36

1	that's PDF Page 188.	10:37:39
2	A Pardon me. Okay, I'm at Column 103.	10:37:49
3	Q So you're in the '551 patent, Column 103.	10:37:52
4	And I would like to specifically start at Line 1.	10:37:57
5	It says, 5.2 Differential Implementations.	10:38:02
6	Do you see that?	10:38:06
7	A I see that, yes.	10:38:09
8	Q And then it says --	10:38:10
9	A Let me blow it up just a bit here. Go	10:38:12
10	ahead.	10:38:14
11	Q And it says, The invention can be	10:38:14
12	implemented in a variety of different --	10:38:15
13	differential configurations. Differential	10:38:18
14	configurations are useful for reducing common mode	10:38:20
15	noise.	10:38:24
16	Do you see that?	10:38:25
17	A Yes, I do see that.	10:38:30
18	Q And what is common mode noise in the	10:38:31
19	context of wireless communications?	10:38:34
20	MR. DAY: Objection. Beyond the scope.	10:38:36
21	A Well, common mode noise is a feature of	10:38:41
22	differential systems. And, you know, basically	10:38:46

1 a -- and not just for wireless communications, for 10:38:55
2 all kinds of electronics differential 10:38:59
3 configurations replace a single signal with two 10:39:03
4 signals who are always exactly opposite of each 10:39:08
5 other. And all -- so all of the -- I apologize 10:39:13
6 for the background noise. 10:39:21

7 So these differential signals replace the 10:39:25
8 single signal that -- that we normally think of. 10:39:28
9 And these differential configurations have a 10:39:32
10 variety of advantages in terms of immunity to 10:39:35
11 noise in particular. And you can sort of -- and 10:39:41
12 common mode noise is a classic example. 10:39:45

13 A common mode noise is a -- is a noise 10:39:48
14 source that affects both of those differential 10:39:51
15 signals equally. And if the differential circuits 10:39:54
16 are well designed, that common mode noise affects 10:39:59
17 both the positive and negative signals equally. 10:40:07
18 And therefore if you take the difference between 10:40:11
19 them, that common mode noise is cancelled. 10:40:13

20 And so this common mode noise is a -- is 10:40:17
21 a ubiquitous noise source in all kinds of 10:40:21
22 electronics applications, and differential 10:40:25

1 configurations are inherently immune or relatively
2 insensitive to that.

3 Q All right. So common --

4 A So that's a long-winded answer to your
5 question.

6 Q So common mode noise, that exists in
7 wireless systems such as WiFi and Bluetooth.
8 Correct?

9 MR. DAY: Object to form, scope.

10 A Yeah, common mode noise exists in all
11 differential electronic systems.

12 Q But it doesn't only exist in differential
13 systems. Correct? It just -- it exists in
14 wireless systems. Right?

15 MR. DAY: Object to form.

16 A Well, I think that you would not talk
17 about common mode noise unless you were using a
18 differential system. And common mode noise would
19 just be referred to as noise if you were not using
20 a differential system.

21 Q So you agree that there's noise is --
22 strike that.

1	You agree in all wireless systems,	10:41:28
2	including WiFi and Bluetooth, receivers have to	10:41:30
3	deal with noise. Correct?	10:41:34
4	A Yes, in wireless systems all -- all	10:41:38
5	wireless systems have to deal with noise.	10:41:41
6	Q All right. And then if you look at the	10:41:43
7	next sentence, This can be very useful in receiver	10:41:44
8	systems where common mode interference can be	10:41:49
9	caused by intentional or unintentional radiators	10:41:52
10	such as cellular phones, CB radios, electronic	10:41:56
11	appliances, et cetera.	10:41:59
12	Do you see that?	10:42:03
13	A I do, yes.	10:42:04
14	Q All right. What's common mode	10:42:04
15	interference?	10:42:06
16	MR. DAY: Object to form, and scope.	10:42:11
17	A Well, I spoke earlier about common mode	10:42:17
18	noise. And noise and interference are, you know,	10:42:18
19	sometimes synonymous, are used interchangeably in	10:42:23
20	discussions of electronic systems.	10:42:31
21	So you know, noise -- interference is a	10:42:33
22	type of noise. And interference is -- or it's an	10:42:35

1 unwanted signal, is perhaps another word. 10:42:41

2 And, you know, interference is just noise 10:42:43
3 or an undesired signal that is -- that arises from 10:42:47
4 a man-made interfering source, like a -- like 10:42:51
5 these examples here, cellular phones, CB radios, 10:42:56
6 electrical appliances. Microwave ovens are a 10:43:03
7 great example. 10:43:07

8 So interference is a man-made source of 10:43:08
9 noise. 10:43:11

10 Q And so the '551 patent is -- or is at 10:43:11
11 least saying, hey, listen, you can use a 10:43:13
12 differential configuration to, you know, help you 10:43:15
13 deal with noise and other sorts of interference. 10:43:19
14 Correct? 10:43:23

15 MR. DAY: Object to form, and scope. 10:43:24

16 A Yeah, I mean, correct. I mean, this 10:43:26
17 discussion is -- has been well known for well over 10:43:29
18 half a century. It's a pretty common, you know, 10:43:32
19 explanation of why we use differential signals. 10:43:36

20 Q And what does it mean that it can be very 10:43:41
21 helpful in receiver systems where common -- where 10:43:47
22 there's common mode interference? 10:43:50

1	What does that mean in the context of the	10:43:54
2	'551 patent?	10:43:55
3	MR. DAY: Object to form, and scope.	10:43:56
4	A I'm sorry, where does it say that? I	10:44:00
5	just want to be --	10:44:01
6	Q Sorry. That's the third sentence. The	10:44:02
7	second sentence says, Differential configurations	10:44:04
8	are useful for reducing common mode noise. This	10:44:06
9	can be very useful in receiver systems where	10:44:10
10	common mode interference can be caused by	10:44:12
11	intentional or unintentional radiators.	10:44:16
12	So I'm trying to understand your	10:44:19
13	understanding of what the '551 patent means by, in	10:44:21
14	that context, this can be very useful in receiver	10:44:26
15	systems.	10:44:29
16	A Well, I think, I guess my interpretation	10:44:31
17	of this is, you know, once again, this is a kind	10:44:35
18	of a textbook explanation of why differential	10:44:40
19	systems are so useful. I mean, they're useful in	10:44:44
20	all kinds of analog systems, wireless, you know	10:44:48
21	included.	10:44:53
22	And basically it's just a recitation of	10:44:53

1	the -- of the, you know, examples where common	10:45:00
2	mode noise is a problem, and that this	10:45:03
3	differential configuration can reduce the	10:45:06
4	sensitivity of the system to that.	10:45:10
5	Q But not all receivers that have ever been	10:45:14
6	made use differential configurations. Correct?	10:45:17
7	MR. DAY: Object to form, and scope.	10:45:20
8	A Well, yes, I'm sure that there have been	10:45:25
9	receivers that don't use differential	10:45:29
10	configurations and some that do. And lots use a	10:45:32
11	mix of both.	10:45:36
12	Q Can you turn to Figures 76A through E,	10:45:37
13	please.	10:45:43
14	A Yes. Could you help me with the page	10:45:46
15	number.	10:45:51
16	Q Yeah. Sure.	10:45:51
17	A Thanks.	10:45:53
18	Q It's Page PDF 98.	10:45:53
19	A Thank you.	10:45:59
20	You said, 76A?	10:46:04
21	Q Yeah.	10:46:08
22	A Yes.	10:46:09

1	Q	All right. So Figure 76 --	10:46:09
2	A	I'm there.	10:46:11
3	Q	Okay. Great.	10:46:12
4	A	Yes. Thank you.	10:46:13
5	Q	The '551 patent, Figures 76A through E,	10:46:14
6		show various differential configurations.	10:46:18
7		Correct?	10:46:21
8		MR. DAY: Object to form, and scope.	10:46:22
9	A	Let me look at B, C, D, and E quickly.	10:46:25
10		MS. KAISER: Jason, while Dr. Larson is	10:46:43
11		looking at that, we have been going for about half	10:46:44
12		an hour now, and I don't think you've asked Dr.	10:46:47
13		Larson a single question about his reply	10:46:50
14		declaration or anything relevant to his reply	10:46:52
15		declaration.	10:46:56
16		MR. CHARKOW: Okay.	10:46:56
17		MS. KAISER: We're trying to be pretty	10:46:59
18		patient on scope. But you asked for this	10:47:00
19		deposition at the very last minute. And I don't	10:47:01
20		think it's appropriate for you to, especially when	10:47:04
21		you have already had a deposition of Dr. Larson,	10:47:09
22		to just ask him questions that have nothing to do	10:47:11

1 with his reply declaration opinions. So -- 10:47:13

2 MR. CHARKOW: They do. They do. And I'm 10:47:15
3 not going to tell you what -- what they have to do 10:47:17
4 with it. So just they do, and you'll see it in 10:47:20
5 our brief. 10:47:23

6 So I can't -- I'm not going to go and sit 10:47:25
7 here on the record and talk about it, but they're 10:47:28
8 very relevant. So I'm going to keep going down 10:47:31
9 this road. Like I said, we are going to go for 10:47:33
10 like an hour. 10:47:35

11 MS. KAISER: Okay. Well, since you said 10:47:35
12 it's going to be short, we'll give you some 10:47:36
13 latitude. But if we continue to go so far afield, 10:47:38
14 then we can get the Board on the phone to see, you 10:47:41
15 know, what they think about the relevance. 10:47:47

16 MR. CHARKOW: Sure. 10:47:47

17 And I just -- Jessica, I just, you know, 10:48:00
18 I -- you know, usually there's only one person 10:48:03
19 defending. So I just -- maybe if you could just 10:48:06
20 talk to your colleague and, you know, on a break, 10:48:10
21 and you can have him put objections in or 10:48:13
22 whatever. But I'm -- usually it's only one 10:48:17

1	person. But I understand what you're saying.	10:48:20
2	Q All right. Dr. Larson, have you had a	10:48:28
3	chance to look at this?	10:48:31
4	A Yes, I've got 76A here in front of me.	10:48:33
5	Q And through E? Sorry.	10:48:36
6	A Yes, through E.	10:48:39
7	Q So let me ask the question again, because	10:48:40
8	I think you -- strike that.	10:48:42
9	The '551 patent, Figures 76A through E,	10:48:52
10	show various differential configurations.	10:48:57
11	Correct?	10:49:02
12	MR. DAY: Object to form, and scope.	10:49:03
13	A Yeah, I mean, various -- they're labeled	10:49:13
14	as various kind of differential configurations.	10:49:16
15	They are, yes.	10:49:21
16	Q Can you go to Paragraph 114 -- strike	10:49:21
17	that.	10:49:24
18	Can you go to Column 114 of the '551	10:49:24
19	patent, please.	10:49:31
20	MR. DAY: Objection. Beyond the scope.	10:49:43
21	A I'm there.	10:49:57
22	Q So let's look Lines 1 through 6. There	10:49:58

1	is a discussion about interference on Line 5.	10:50:07
2	Do you see that?	10:50:12
3	MR. DAY: Objection. Beyond the scope.	10:50:14
4	A That's the second sentence in that	10:50:25
5	paragraph.	10:50:27
6	Q Yeah.	10:50:28
7	A Yes.	10:50:29
8	Q Do you see the word interference?	10:50:30
9	A I do, yes. Sorry.	10:50:33
10	Q What is interference in the context of	10:50:34
11	wireless communications?	10:50:36
12	A Well, interference in the context of	10:50:42
13	wireless communications is, you know, any man-made	10:50:45
14	signal that is undesirable from the perspective of	10:50:53
15	the signal that you're trying to receive.	10:50:59
16	Q And that's true in the context of WiFi	10:51:03
17	and Bluetooth. Correct?	10:51:07
18	A That can be applied to WiFi and Bluetooth	10:51:12
19	systems, yes.	10:51:14
20	Q And what does it mean that the -- if you	10:51:15
21	read the whole paragraph there, Lines 1 through 6	10:51:19
22	in Column 114, what does it mean that a half cycle	10:51:23

1	generates a spectrum less subject to interference?	10:51:28
2	MR. DAY: Object to form, and scope.	10:51:33
3	A Let's see. So they're referring to	10:51:58
4	Figures 106 and 107, and I'd like to go up and	10:52:02
5	take a quick look at them.	10:52:05
6	Q Sure.	10:52:06
7	A Thank you. I'm sorry, can you -- what	10:52:08
8	paragraph was it again? I lost it.	10:52:55
9	Q Sure. It's Column -- you mean Column?	10:52:56
10	A Column, sorry. Yeah.	10:52:59
11	Q Column 114, PDF 193.	10:53:02
12	A Thank you. I'm just going to write down	10:53:10
13	114 here so that I don't forget it. And I'm	10:53:32
14	sorry, I just want to go back to look at now	10:53:35
15	Figure 99 and 108, which I'll do very quickly.	10:53:38
16	Q Oh, okay. I see what you're saying.	10:53:43
17	A Yeah, because they're contrasting it to	10:53:46
18	something, and I want to see what they're	10:53:47
19	contrasting it to.	10:53:49
20	Q Sure. Go ahead.	10:53:50
21	MR. DAY: Objection. Beyond the scope.	10:53:51
22	A Okay, I'm back at 114. And I've reviewed	10:54:48

1 Figures 99 and 108 and 106 and 107.

10:54:51

2 Could you repeat your question please.

10:54:54

3 Q Sure. What does it mean that the half
4 cycle generates a spectrum less subject to
5 interference?

10:54:56

10:55:00

10:55:02

6 MR. DAY: Object to form. Beyond the
7 scope.

10:55:04

10:55:06

8 A Well, they seem to be implying that that
9 particular waveform, which is 10602, provides a
10 spectral content for the sampler that provides
11 improved sensitivity, or it's less subject to
12 interference than the pulses that were shown in
13 Figures 99 and 108.

10:55:10

10:55:13

10:55:26

10:55:35

10:55:39

10:55:48

14 And that's what -- that's what that
15 paragraph implies.

10:55:55

10:55:57

16 Q And something that provides for improved
17 sensitivity would be relevant to meeting WiFi and
18 Bluetooth standards. Correct?

10:55:57

10:56:03

10:56:07

19 MR. DAY: Object to form, and scope.

10:56:09

20 A Yes; any time sensitivity is improved,
21 the WiFi system performance will improve.

10:56:14

10:56:16

22 Q Can you go to Paragraph 66 please --

10:56:20

1	sorry, strike that.	10:56:23
2	Can you go to Column 66.	10:56:24
3	A Okay, I'm there.	10:56:41
4	Q And if you can go to Line 40 please.	10:56:42
5	A I'm there.	10:56:56
6	Q All right. And you see there is a	10:56:56
7	discussion, you know, if you keep reading the	10:56:58
8	sentence, about impedance matching.	10:57:01
9	Do you see that?	10:57:03
10	MR. DAY: Object to form, and scope.	10:57:04
11	A I see that, yes, it mentions.	10:57:16
12	Q What's impedance matching in the context	10:57:18
13	of wireless communications?	10:57:20
14	MR. DAY: Object to form. And beyond the	10:57:25
15	scope.	10:57:27
16	A Impedance matching refers to the idea	10:57:36
17	that in order to transfer the maximum amount of	10:57:38
18	power from a source, the load should have an	10:57:45
19	impedance which is the complex conjugate of the	10:57:56
20	source impedance. And that matching of the load	10:58:02
21	impedance to the source impedance is called	10:58:08
22	impedance matching.	10:58:13

1	Q	And impedance matching is relevant to	10:58:14
2		meeting WiFi and Bluetooth standards. Correct?	10:58:18
3	MR. DAY:	Object to form, and scope.	10:58:20
4	A	You know, wireless circuits often will	10:58:27
5		use impedance matching at -- at high frequencies	10:58:29
6		in order to achieve the best power transfer.	10:58:33
7	Q	Right. So impedance matching has some	10:58:37
8		relevance to meeting WiFi and Bluetooth standards.	10:58:39
9		Correct? It's --	10:58:42
10	MR. DAY:	Object to form. Object to	10:58:42
11		form, and beyond the scope.	10:58:44
12	MR. CHARKOW:	Can I finish my question.	10:58:46
13	Q	It's one of the things you can do to meet	10:58:47
14		WiFi and Bluetooth standards. Correct?	10:58:49
15	MR. DAY:	Same objections.	10:58:52
16	A	Yeah, I mean, I would have to say that	10:58:54
17		this is a very, very common -- impedance matching	10:58:55
18		is a very, very common technique for improving the	10:58:59
19		performance of wireless circuits.	10:59:03
20	Q	So can you go to -- so I'm going to	10:59:04
21		switch over to the '686 patent. So can you switch	10:59:09
22		over to the '686 patent please.	10:59:13

1	A	Yes.	10:59:19
2	Q	If we could turn to Column 11. Strike	10:59:19
3		that. Let me just ask you a quick question.	10:59:40
4		Using differential configurations can	10:59:43
5		also be used to meet WiFi and Bluetooth standards.	10:59:46
6		Correct?	10:59:51
7		MR. DAY: Object to form, and scope.	10:59:52
8	A	Well, I mean, differential configurations	10:59:56
9		are ubiquitous in electronic systems, so they can	11:00:00
10		certainly be used to -- in an electronic system	11:00:04
11		that implements a wireless standard.	11:00:07
12	Q	Sorry. If we can go back to Column 11	11:00:12
13		please. '686 patent.	11:00:16
14	A	Yes. Okay, I'm there.	11:00:24
15	Q	All right. And if you can go to -- if	11:00:31
16		you could review Column 11, Line 28, to Column 12,	11:00:34
17		Line 67, please, and let me know when you've	11:00:41
18		finished.	11:00:46
19	A	So I'm just going to write that down.	11:00:47
20	Q	Yeah. 11, 28 to 12, 67.	11:00:48
21	A	To 12, 67?	11:00:55
22	Q	Yes.	11:00:57

1	A	Yes. Okay.	11:00:58
2		Okay, I think I have read it.	11:04:48
3	Q	So in the '686 patent Column 11, Line 28,	11:04:50
4		to Column 12, Line 67, is explaining how to	11:04:53
5		calculate a frequency for a control signal given	11:04:58
6		input signal frequency. Correct?	11:05:02
7		MR. DAY: Object to form, and scope.	11:05:05
8	A	I'm sorry. Could you refer me to the	11:05:07
9		line number again.	11:05:09
10	Q	Sure. It's --	11:05:10
11	A	Or the column number and line --	11:05:11
12	Q	Column 11, Line, 28 to Column 12, Line	11:05:13
13		67.	11:05:16
14	A	Oh, for the whole thing?	11:05:17
15	Q	Yeah.	11:05:18
16	A	And I'm sorry, could you repeat your	11:05:19
17		question.	11:05:21
18	Q	In the '686 patent Column 11, Line 28, to	11:05:22
19		Column 12, Line 67, is explaining how to calculate	11:05:27
20		a frequency for a control signal or an LO signal	11:05:30
21		given an input signal frequency. Correct?	11:05:34
22		MR. DAY: Object to form, and scope.	11:05:38

1	A	Yes. They -- yeah, the columns and	11:05:41
2		paragraphs that you've cited talk about	11:05:46
3		calculating a control signal frequency based on	11:05:49
4		certain desired down-conversion frequencies.	11:05:54
5	Q	Right.	11:05:59
6	A	There are -- there are certain I think	11:06:00
7		errors in these paragraphs, but that's their	11:06:02
8		intent.	11:06:06
9	Q	Right. And they're -- that column and	11:06:07
10		line number is teaching frequencies that fall	11:06:12
11		within the WiFi and Bluetooth standards. Correct?	11:06:14
12	MR. DAY:	Object to form, and scope.	11:06:18
13	Q	Input frequencies, I mean.	11:06:19
14	A	Well, no, actually. The -- I think	11:06:23
15		they're referring to a 900 megahertz input,	11:06:26
16		roughly. And Bluetooth is a 2.4. And WiFi is at,	11:06:29
17		you know, 2.4 and 5. And so I think these are	11:06:34
18		certainly not Bluetooth frequencies, and I don't	11:06:39
19		think they're WiFi frequencies either.	11:06:41
20	Q	But it's explaining how to calculate LO	11:06:44
21		signals for any frequency. Right?	11:06:48
22		The formulas are not limited to any	11:06:50

1	particular input frequency. Correct?	11:06:54
2	MR. DAY: Object to form, and scope.	11:06:56
3	A Well, the formulas have a very specific	11:07:04
4	frequency; you know, 901 megahertz. But I think	11:07:07
5	that they -- they -- they're a specific example	11:07:12
6	that -- which could be generalized to other	11:07:16
7	frequencies I mentioned.	11:07:18
8	Q Right. Including WiFi and Bluetooth?	11:07:19
9	A They could --	11:07:22
10	MR. DAY: Object to form, and scope.	11:07:22
11	A They could be generalized to WiFi and	11:07:24
12	Bluetooth. Although as I said, there are some	11:07:26
13	errors here that might have to be rectified for	11:07:28
14	those systems.	11:07:35
15	Q So what is frequency selectivity?	11:07:37
16	MR. DAY: Object to form, and scope.	11:07:44
17	A Frequency selectivity is the ability of a	11:07:48
18	receiver to receive without error frequencies	11:07:52
19	of -- at a certain point and reject signals at	11:08:03
20	frequencies of other values.	11:08:08
21	Q Can you go to Column 27 of the patent	11:08:12
22	please. Of the '686 patent.	11:08:16

1	A	Yes. Okay. I'm at Line -- I'm sorry,	11:08:21
2		I'm at Column 27.	11:08:38
3	Q	So Column 27 of the '686 patent, Line 17.	11:08:41
4		And it talks about Figure 17.	11:08:48
5	A	Yes, I see it.	11:08:53
6	Q	And around Line 19 through 20 it says the	11:08:54
7		UDF module 1702 performs at least frequency	11:08:59
8		translation and frequency selectivity.	11:09:03
9		Do you see that?	11:09:05
10		MR. DAY: Objection. Beyond the scope.	11:09:06
11	A	Yes, I do.	11:09:09
12	Q	All right. And then if you keep reading	11:09:10
13		down, it says -- sorry. Strike that. So if you	11:09:16
14		read Line 21, it says -- starting 21. So strike	11:09:40
15		that.	11:09:45
16		If you read Column 27, starting at Line	11:09:45
17		21, it says, The effect achieved by the UDF module	11:09:49
18		1702 is to perform the frequency selectivity	11:09:53
19		operation prior to the performance of the	11:09:55
20		frequency translation operation.	11:09:58
21		Do you see that?	11:10:00
22		MR. DAY: Objection. Beyond the scope.	11:10:03

1	A	Yes, I see that.	11:10:05
2	Q	All right. And what is the advantage of	11:10:06
3		performing frequency selectivity before frequency	11:10:09
4		translation, or down-conversion?	11:10:12
5	A	Let me just take a quick look at Figure	11:10:17
6		17.	11:10:19
7	Q	And while you do that, let me ask you a	11:10:43
8		question.	11:10:45
9		Frequency selectivity pertains to WiFi	11:10:46
10		and Bluetooth standards. Correct?	11:10:48
11		MR. DAY: Object to form, and scope.	11:10:51
12	A	Yeah, frequency selectivity is important	11:10:56
13		for those wireless standards.	11:10:59
14		Okay. And I do apologize. Could you	11:11:06
15		refer me back to the -- to the column that we were	11:11:08
16		talking about.	11:11:10
17	Q	Sure. 27.	11:11:10
18	A	Thank you.	11:11:14
19	Q	We were at Line 17 to 24.	11:11:15
20	A	Okay. And, I'm sorry. Could you ask me	11:11:30
21		the question again.	11:11:32
22	Q	What is the advantage of performing	11:11:32

1	frequency selectivity before frequency	11:11:34
2	translation, or down-conversion?	11:11:36
3	MR. DAY: Objection, form, and scope.	11:11:40
4	A Well, frequency selectivity refers to the	11:11:42
5	fact that we want to accept signals at some	11:11:49
6	frequency and reject signals at other frequencies.	11:11:53
7	And it is desirable to do this prior to frequency	11:12:02
8	translation, because the frequency translation	11:12:09
9	module often will have imperfect frequency	11:12:15
10	selectivity.	11:12:22
11	And the prefiltering that's shown in the	11:12:25
12	Figure 17 is a way of rejecting those frequencies	11:12:30
13	using a filter so that the frequency translation	11:12:35
14	does not have to accomplish that.	11:12:41
15	Q So can you go to Column 27. So same	11:12:46
16	column, further down, Line 62.	11:12:51
17	MR. DAY: Objection. Beyond the scope.	11:13:00
18	A I'm there.	11:13:03
19	Q So if you look to 62 through 28, Line 2.	11:13:03
20	So if you could just read starting at 62 and go	11:13:14
21	all the way to Column 28, Line 2, and let me know	11:13:17
22	when you're done.	11:13:21

1	A	Okay, I've read that.	11:13:40
2	Q	And you see it talks about high	11:13:41
3		selectivity at high frequencies?	11:13:44
4	MR. DAY:	Objection. Beyond the scope.	11:13:50
5	A	Right. That's, I guess, in the first --	11:14:09
6		the second sentence of that paragraph. Yes.	11:14:11
7	Q	And what does high selectivity at high	11:14:13
8		frequencies mean in the context of the '686	11:14:19
9		patent?	11:14:21
10	MR. DAY:	Objection to form. Beyond the	11:14:21
11		scope.	11:14:24
12	A	Well, you know, like any wireless system,	11:14:25
13		this is describing a very, very standard	11:14:29
14		requirement that's, you know, been known for	11:14:31
15		decades. That for high frequencies like in	11:14:34
16		wireless systems, you want them to have high	11:14:38
17		selectivity, you want them to accept the desired	11:14:40
18		frequencies and reject the undesired frequencies.	11:14:45
19	Q	Right. And that's applicable also to	11:14:50
20		WiFi and Bluetooth standards. Correct?	11:14:51
21	A	Yes, this is well known to be applicable.	11:14:54
22		The high selectivity at high frequencies is very,	11:14:58

1 very well known and applicable to WiFi and 11:15:01

2 Bluetooth, among a million others. 11:15:04

3 Q What is a -- what is a Q factor? Do you 11:15:08

4 see that in there? 11:15:14

5 MR. DAY: Object to form, and scope. 11:15:14

6 A Yeah, the Q factor is -- well, it says 11:15:19

7 here that the -- I'm just going to read from the 11:15:26

8 top of Column 28. The Q is equal to the center 11:15:29

9 frequency divided by the bandwidth. 11:15:33

10 The Q is like the relation -- the ratio 11:15:35

11 of the stored energy in a resonator to the 11:15:39

12 dissipated energy. And, you know, the higher the 11:15:42

13 Q, if you built a filter with that resonator, that 11:15:45

14 allows it to have a very, very high selectivity. 11:15:49

15 So, yeah, a Q of 18,000 is very high and 11:15:53

16 kind of represents the -- your ability to achieve 11:16:00

17 a high selectivity filter. 11:16:04

18 Q Okay. Which a Q factor obviously is 11:16:06

19 relevant to WiFi and Bluetooth standards. 11:16:09

20 Correct? 11:16:12

21 MR. DAY: Object to form, and scope. 11:16:13

22 A Yeah, I mean, you know, the claims of the 11:16:16

1 patent don't talk at all about these 11:16:18
2 preselectivity filters. So the specification is 11:16:20
3 just reciting standard, you know, wireless 11:16:24
4 requirements of a high Q, you know, high 11:16:27
5 selectivity filter. 11:16:30

6 Q Right. Which would be relevant to WiFi 11:16:33
7 and Bluetooth standards. Correct? 11:16:35

8 MR. DAY: Object to form, and scope. 11:16:38

9 A Yeah, these general wireless things that 11:16:39
10 they're reciting are very relevant to WiFi and 11:16:43
11 Bluetooth. 11:16:46

12 Q And if you can go to Column 14 -- sorry, 11:16:46
13 strike that. If you can go to Column 15 of the 11:16:50
14 patent. And that's PDF Page 116. 11:16:54

15 Well, first of all let me ask you this. 11:17:02
16 What is input impedance matching? 11:17:05

17 MR. DAY: Objection to form, and scope. 11:17:10

18 A Well, as I said earlier, you know, 11:17:12
19 impedance matching is the process of optimizing 11:17:15
20 the power transfer between a source and a load. 11:17:22
21 And the way that we do that is by making the load 11:17:29
22 impedance the complex conjugate of the source 11:17:33

1	impedance.	11:17:37
2	So the load is often thought to be the	11:17:38
3	input of the next stage of a system. So input	11:17:42
4	impedance matching is just this process of	11:17:45
5	impedance matching applied to the input of a -- of	11:17:51
6	something.	11:17:55
7	Q So now can you look at Column 15,	11:17:55
8	starting at Line 20 please.	11:18:00
9	MR. DAY: Objection. Form, and scope.	11:18:08
10	A I see this, yes.	11:18:18
11	Q So it says, An additional benefit of	11:18:19
12	impedance matching is that filtering of unwanted	11:18:24
13	signals can also be accomplished with the same	11:18:28
14	components.	11:18:30
15	Do you see that?	11:18:30
16	A I do see that.	11:18:32
17	MR. DAY: Objection to form, and scope.	11:18:34
18	Q What are unwanted signals?	11:18:35
19	MR. DAY: Same objection.	11:18:38
20	A Let me just read the paragraph so that I	11:18:47
21	understand the context a little bit.	11:18:49
22	Q Sure. Go ahead.	11:18:51

1 A Okay. So I'm sorry, I've read that whole 11:20:19
2 paragraph. Could you repeat your question please. 11:20:21

3 Q What are unwanted signals that are being 11:20:23
4 referred to in the '686 patent? 11:20:26

5 MR. DAY: Object to form, and scope. 11:20:30

6 A Well, I think that this particular 11:20:33
7 paragraph is referring to the unwanted signals 11:20:35
8 that appear at the output. And those unwanted 11:20:42
9 signals could be, you know, other signals that are 11:20:51
10 close in frequency to the desired signal, and -- 11:20:59
11 but you don't want to listen to them because 11:21:05
12 they're not the ones that you're interested in. 11:21:07

13 So these would be the -- these unwanted 11:21:11
14 signals would be signals that are received and are 11:21:13
15 close to the desired signal, but separate from it. 11:21:19

16 Q And one of the things when you're dealing 11:21:28
17 with WiFi and Bluetooth standards is to consider 11:21:31
18 unwanted signals. Correct? Like how do you deal 11:21:34
19 with unwanted signals. Right? 11:21:37

20 MR. DAY: Object to form, and scope. 11:21:39

21 A Yes, unwanted signals and how you deal 11:21:43
22 with them is an important consideration in 11:21:46

1	wireless systems.	11:21:48
2	Q Right. And this is -- the patent, the	11:21:51
3	'686 patent is proposing using impedance matching.	11:21:54
4	Correct?	11:21:58
5	MR. DAY: Object to form, and scope.	11:21:59
6	Q Or at least it's discussing it?	11:22:01
7	A Yeah. Well, this particular paragraph	11:22:05
8	discusses it. And once again, it's -- I think	11:22:07
9	that there are some actually technical errors in	11:22:17
10	this paragraph. So it discusses it, but I'm not	11:22:19
11	sure that I agree with what they're saying.	11:22:21
12	Q But it's discussing impedance matching.	11:22:25
13	Correct? I don't think we can dispute that.	11:22:28
14	A Impedance matching is mentioned in this	11:22:30
15	paragraph, yes.	11:22:31
16	Q Right. And it's proposing a way --	11:22:32
17	it's -- strike that.	11:22:35
18	The '686 patent is proposing to use	11:22:36
19	impedance matching as a way to address unwanted	11:22:39
20	signals. Correct? Factually that's what it's	11:22:43
21	saying?	11:22:46
22	MR. DAY: Objection to form, and scope.	11:22:46

1	A	It is saying that. I'm not sure that its	11:22:48
2		description is correct, however.	11:22:50
3	Q	Okay.	11:22:51
4		MR. CHARKOW: Let's take a break.	11:22:53
5		THE WITNESS: Okay.	11:22:58
6		MR. CHARKOW: Off the record please.	11:22:59
7		VIDEO SPECIALIST: We are now going off	11:23:02
8		the record. The time is 11:23 a.m.	11:23:04
9		(A recess was taken.)	11:23:06
10		VIDEO SPECIALIST: We are now back on the	11:28:26
11		record. The time is 11:29 a.m.	11:28:37
12		BY MR. CHARKOW:	11:28:43
13	Q	In the context of WiFi and Bluetooth,	11:28:44
14		what is dynamic range?	11:28:46
15		MR. DAY: Object to form, and scope.	11:28:50
16	A	Dynamic range is a measure of the	11:28:53
17		difference between the largest signal the receiver	11:29:03
18		can accommodate and the smallest signal the	11:29:07
19		receiver can accommodate. In both cases meet the	11:29:11
20		quality criteria of the wireless standard bit	11:29:16
21		error rate, for example.	11:29:19
22	Q	And sensitivity of a -- sensitivity	11:29:21

1	relates to dynamic range. Correct?	11:29:32
2	MR. DAY: Object to form, and scope.	11:29:34
3	A Well, sensitivity is related to dynamic	11:29:37
4	range in the sense that, you know, they both use	11:29:43
5	the system performance specifications to set their	11:29:51
6	values.	11:29:56
7	Q And the greater dynamic range is better.	11:29:58
8	Right? Larger dynamic range is a better thing?	11:30:02
9	MR. DAY: Object to form.	11:30:06
10	A Generally, you know, the higher the	11:30:09
11	dynamic range of a wireless system, the better its	11:30:10
12	RF performance. There are always trade-offs. A	11:30:14
13	higher dynamic range can often require more power	11:30:18
14	consumption.	11:30:22
15	But generally from an RF perspective, a	11:30:23
16	higher dynamic range is better.	11:30:25
17	Q And how does one go about improving	11:30:26
18	dynamic range?	11:30:29
19	MR. DAY: Object to form.	11:30:31
20	A Well, dynamic range can be improved or	11:30:34
21	adjusted by sort of two broad things; either	11:30:42
22	improving sensitivity of the receiver reducing its	11:30:48

1 noise, or improving its linearity which allows it
2 to accommodate a larger signal. So those are the
3 two typical methods for improving dynamic range.

4 Q And why is improving dynamic range
5 important?

6 MR. DAY: Object to form.

7 A Well, wireless systems, as is well known,
8 operate in an incredibly dynamic environment. And
9 these systems have to accommodate big signals and
10 small signals and perform well under all
11 conditions.

12 And so dynamic range is a -- you know, is
13 a way of measuring how well the system responds to
14 those varying signal levels.

15 Q In the context of WiFi and Bluetooth,
16 what is sensitivity?

17 MR. DAY: Object to form.

18 A Yeah, sensitivity in a -- in a WiFi and
19 Bluetooth is just the received signal level at the
20 input that achieves the desired performance
21 specification, which is usually a bit error rate
22 performance.

1	Q	And so sensitivity relates to meeting	11:32:16
2		WiFi and Bluetooth standards. Correct?	11:32:21
3	MR. DAY:	Object to form.	11:32:22
4	A	Well, Bluetooth and WiFi will both have	11:32:25
5		sensitivity specifications as part of their	11:32:28
6		overall specs.	11:32:31
7	Q	Right. So in order to meet Bluetooth and	11:32:35
8		WiFi specifications, protocols, you need to meet	11:32:38
9		certain sensitivity requirements. Correct?	11:32:45
10	MR. DAY:	Object to form.	11:32:47
11	A	Yeah; and those sensitivity	11:32:48
12		specifications are defined by the Bluetooth and	11:32:50
13		WiFi standards.	11:32:52
14	Q	And how does one go about or how does a	11:32:53
15		POSITA go about improving sensitivity?	11:33:00
16	MR. DAY:	Object to form.	11:33:02
17	A	Well, sensitivity of a receiver is	11:33:07
18		usually characterized by its noise figure. And so	11:33:14
19		to improve the sensitivity of the receiver, you'd	11:33:22
20		want to improve its noise figure.	11:33:24
21	Q	And when you say, want to improve its	11:33:27
22		noise figure, what do you mean?	11:33:30

1	MR. DAY: Object to form.	11:33:32
2	A To improve the noise figure would be to	11:33:33
3	lower its noise figure.	11:33:35
4	Q So a lower noise figure is better.	11:33:39
5	Correct?	11:33:41
6	MR. DAY: Object to form.	11:33:42
7	A You know, for most wireless systems a	11:33:47
8	lower noise figure is better. You know, as I said	11:33:49
9	before, there are trade-offs. But from a purely	11:33:51
10	RF performance perspective, a lower noise figure	11:33:55
11	is better.	11:33:58
12	Q And why is improving sensitivity	11:34:00
13	important?	11:34:03
14	MR. DAY: Object to form.	11:34:05
15	A Well, improving sensitivity is important	11:34:11
16	because you'd like your receiver to operate in	11:34:21
17	conditions where the received signal is very	11:34:30
18	small.	11:34:37
19	And so improving a sensitivity means that	11:34:37
20	the received signal can be smaller and you can	11:34:40
21	still meet the system performance requirements,	11:34:45
22	bit error rate for example.	11:34:49

1 Q And when you say, system performance 11:34:51
2 requirements, you were talking about, for example, 11:34:54
3 like WiFi and Bluetooth standards. Correct? 11:34:57

4 MR. DAY: Object to form. 11:34:59

5 A Yeah, WiFi and Bluetooth are great 11:35:01
6 examples of wireless systems that have these 11:35:03
7 performance specifications. 11:35:05

8 Q And in the context of WiFi and Bluetooth, 11:35:07
9 what is interference tolerance? 11:35:09

10 MR. DAY: Object to form. 11:35:13

11 A Well, in a -- let's take a Bluetooth 11:35:17
12 system for example. 11:35:22

13 There's a desired signal that you want to 11:35:25
14 receive, and it is at a certain frequency. But 11:35:29
15 there are lots of other frequencies that are also 11:35:33
16 coexisting at the same time, and your antenna 11:35:39
17 receives those also. 11:35:45

18 So interference tolerance in that context 11:35:46
19 means you're -- the ability of the receiver to 11:35:50
20 accurately, you know, receive the desired signal 11:35:59
21 and not be -- and not have that reception 11:36:02
22 corrupted by the nearby interfering signals. 11:36:05

1	Q	All right. And interference tolerance,	11:36:08
2		you have to meet -- strike that.	11:36:16
3		With regards to WiFi and Bluetooth	11:36:17
4		standards, in order to meet those standards you	11:36:19
5		have to meet certain interference tolerances.	11:36:21
6		Correct?	11:36:24
7	MR. DAY:	Object to form.	11:36:26
8	A	Yeah, both standards have certain tests	11:36:28
9		that the receiver has to make in order to be	11:36:33
10		compliant to the standard; and those are	11:36:37
11		interference -- some of those tests are	11:36:40
12		interference tolerance tests.	11:36:42
13	Q	And a system with improved interference	11:36:45
14		tolerance is better. Correct?	11:36:48
15	MR. DAY:	Object to form.	11:36:50
16	A	Well, generally for any wireless system	11:36:54
17		better interference tolerance is a good thing.	11:36:59
18		But you know, as I mentioned before, there are	11:37:01
19		always trade-offs. And those trade-offs have to	11:37:04
20		be considered in the overall system design.	11:37:08
21	Q	How does one improve -- how does a POSITA	11:37:09
22		improve interference tolerance?	11:37:13

1	MR. DAY: Object to form.	11:37:15
2	A Well, there are a variety of ways to	11:37:20
3	improve interference tolerance. Improving	11:37:24
4	frequency selectivity is an example. You know,	11:37:29
5	better linearity is an example in the receiver	11:37:36
6	design.	11:37:40
7	You know, improved filtering at various	11:37:46
8	stages of the -- of the receiver chain is another	11:37:48
9	way.	11:37:52
10	So there are a variety of ways of	11:37:53
11	improving tolerance.	11:37:55
12	Q And why is improved interference	11:37:56
13	tolerance important in wireless systems such as	11:38:01
14	WiFi and Bluetooth?	11:38:03
15	A Well, the electromagnetic spectrum is	11:38:08
16	very crowded with all kinds of services. And you	11:38:12
17	want to -- and yet your receiver pretty much	11:38:19
18	receives, you know, all of them at any given	11:38:23
19	moment.	11:38:26
20	So the -- everything except what you want	11:38:27
21	to listen to at that particular moment is	11:38:31
22	interference. And you want to design a receiver	11:38:34

1 to reject all of that interference and accurately, 11:38:37
2 you know, receive only the desired signal that 11:38:42
3 you're interested in. 11:38:45

4 Q All right. And in the context of WiFi 11:38:47
5 and Bluetooth, what is image rejection? 11:38:49

6 MR. DAY: Object to form. 11:38:53

7 A Well, image rejection is a general 11:38:59
8 feature of all frequency conversion systems, 11:39:05
9 particularly down-conversion frequency conversion 11:39:10
10 systems. And it's a form of interference. 11:39:13

11 So I should say that the image is a form 11:39:23
12 of interference, that in certain frequency 11:39:27
13 down-conversion systems the image will actually be 11:39:30
14 down-converted to the exact same frequency as the 11:39:39
15 desired signal. 11:39:42

16 And so that's a form of interference that 11:39:44
17 is undesirable, and it's a particular feature of 11:39:48
18 frequency converting or down-converting systems. 11:39:53

19 Q And in order to meet WiFi and Bluetooth 11:39:55
20 standards, you have to have a certain amount of 11:39:58
21 image rejection. Correct? 11:40:00

22 MR. DAY: Object to form. 11:40:02

1 A Well, image rejection is a -- is a
2 feature of a certain type of down-conversion
3 system known as a heterodyne. And if you use a
4 homodyne down-conversion system, image rejection
5 is not a big problem. There are other problems
6 associated, but image rejection is typically not a
7 big problem.

8 So it sort of depends on -- the answer to
9 your question is, it depends. And it depends on
10 the frequency plan of the system. And that would
11 be true for WiFi or Bluetooth or any other system.

12 Q How do you improve image rejection in the
13 context of a Bluetooth or WiFi system?

14 MR. DAY: Object to form.

15 A Well, you know, one thing you could do
16 is, you could just go to a homodyne
17 down-converter. And that sort of gets rid of the
18 problem of image rejection, or dramatically
19 reduces it.

20 If you use a heterodyne down-conversion
21 system, then, you know, there are filtering
22 techniques that could be used, improved filters.

1 The matching between components in the 11:41:28
2 down-converter becomes critical for good image 11:41:31
3 rejection performance, and you'd want to improve 11:41:35
4 the matching potentially. 11:41:38

5 So matching, filtering, going to a 11:41:39
6 different architecture, these are ways that you 11:41:41
7 could improve on image rejection. And this is 11:41:43
8 true for all wireless systems, WiFi and Bluetooth 11:41:46
9 included. 11:41:50

10 Q In the context of WiFi and Bluetooth, 11:41:51
11 what is distortion? 11:41:53

12 MR. DAY: Object to form. 11:41:58

13 A Well, distortion is another wireless 11:42:00
14 concept that is universal for all wireless 11:42:09
15 systems. It's important for all wireless systems. 11:42:11
16 And basically distortion is -- you know, it's 11:42:13
17 almost self-explanatory. It's an error or a 11:42:20
18 distortion of the input signal. 11:42:24

19 And that distortion has a lot of, you 11:42:29
20 know, detrimental qualities to the quality of 11:42:34
21 the -- detrimental effects on the quality of the 11:42:37
22 received signal. 11:42:40

1 So it's a -- it's a distortion or an 11:42:43
2 error in the received signal that causes 11:42:48
3 performance problems. 11:42:50

4 Q And so less distortion is better. Right? 11:42:51

5 A From an RF systems perspective, less 11:42:57
6 distortion is always better. And as I said 11:43:02
7 before, there are always trade-offs. And so you 11:43:04
8 have to consider those trade-offs when setting the 11:43:07
9 correct distortion level. And that's true for all 11:43:10
10 wireless systems. 11:43:12

11 Q And how do you reduce distortion in a 11:43:13
12 wireless -- a WiFi or Bluetooth -- well, strike 11:43:17
13 that. 11:43:19

14 Distortion, you have to meet -- 11:43:19
15 distortion is something that one considers in 11:43:22
16 trying to meet Bluetooth and WiFi standards. 11:43:25
17 Correct? 11:43:27

18 MR. DAY: Object to form. 11:43:28

19 A Well, Bluetooth and WiFi standards are 11:43:31
20 usually -- are -- I believe are silent on 11:43:33
21 distortion per se. But distortion can result in 11:43:37
22 other bad things that the system specifications do 11:43:44

1	specify; interference performance is an example.	11:43:48
2	Q And how do you reduce distortion in a	11:43:54
3	WiFi or Bluetooth system?	11:44:10
4	MR. DAY: Object to form.	11:44:11
5	A Well, you can reject distortion, you	11:44:13
6	know, quite a few different ways. You know,	11:44:20
7	improved filtering throughout the system can	11:44:23
8	reduce distortion. Increasing DC power	11:44:26
9	consumption can reduce distortion. Certain	11:44:30
10	circuit topologies inherently have lower	11:44:34
11	distortion than others. And so there are	11:44:37
12	architectural changes that you can make.	11:44:39
13	So there are a variety of techniques for	11:44:42
14	reducing distortion.	11:44:45
15	Q And less distortion is better. Right?	11:44:49
16	MR. DAY: Object to form.	11:44:54
17	A Well, less distortion is usually better	11:44:59
18	from an RF system performance. Although, as I	11:45:01
19	said before, you know, there's a trade-off there.	11:45:04
20	I mentioned DC power consumption, circuit	11:45:07
21	complexity, filtering; these all have to be traded	11:45:10
22	off in the final system design.	11:45:14

1 Q And you mentioned a filter, filtering. 11:45:16

2 One way to implement a filter is to use a 11:45:18

3 resistor and capacitor. Correct? 11:45:20

4 MR. DAY: Object to form. 11:45:25

5 A Resistors and capacitors, yeah, can be 11:45:28

6 used as a filter in certain contexts. 11:45:31

7 Q All right. And that's sometimes referred 11:45:36

8 to as an RC filter. Right? 11:45:38

9 MR. DAY: Object to form. 11:45:42

10 A Yeah, resistor capacitor filters are 11:45:43

11 often called RC filters. 11:45:47

12 Q Right. In the context of WiFi and 11:45:48

13 Bluetooth, what is second-order intermodulation? 11:45:50

14 MR. DAY: Object to form. 11:45:53

15 A So second-order intermodulation is a -- 11:45:57

16 it's a distortion that wireless systems often have 11:46:07

17 to deal with. And the -- it's a consequence of 11:46:11

18 the fact that you often have multiple frequencies 11:46:18

19 at the input. 11:46:23

20 And second-order intermodulation 11:46:25

21 distortion is where two input signals appear at 11:46:29

22 the input of the receiver and are very close 11:46:35

1 together in frequency, and the receiver distorts
2 those two signals.

3 And one of the consequences of that is
4 that a new signal appears at the difference
5 between those two input signals. And that new
6 signal is called a second-order intermodulation
7 product.

8 And the problem with that is that, very
9 often that second-order intermodulation product
10 could be at the desired frequency that you're
11 down-converting to.

12 And so that's what second-order
13 intermodulation is.

14 Q And second-order intermodulation
15 distortion in WiFi and Bluetooth, that's a bad
16 thing. Right?

17 MR. DAY: Object to form.

18 A Well, it depends a little bit on your
19 receiver architecture, actually.

20 And in some -- some receivers and some
21 down-converters are planned so that second-order
22 distortion is not a particularly important issue,

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1 but in other cases it can be very important. So 11:47:49
2 it really depends on the frequency plan of your 11:47:52
3 particular receiver. 11:47:55

4 Q And second-order intermodulation and the 11:47:55
5 distortion that results from that is something 11:48:08
6 that you -- that one, a POSITA would look at to 11:48:10
7 meet WiFi and Bluetooth standards. Correct? 11:48:13

8 MR. DAY: Object to form. 11:48:16

9 A Well, you know, as I said before, I think 11:48:18
10 it depends on the architecture of the receiver. 11:48:20
11 And -- I should say the frequency plan of the 11:48:26
12 receiver. 11:48:30

13 And you could design a receiver that was 11:48:31
14 very insensitive to second-order distortion. And 11:48:33
15 so a person of ordinary skill in the art might not 11:48:38
16 be particularly worried about that in the context 11:48:42
17 of WiFi or Bluetooth to meet those standards, 11:48:44
18 depending on the -- on the frequency plan. 11:48:47

19 Q So, but high second-order intermodulation 11:48:49
20 distortion, that's not a good thing. Right? 11:48:53

21 If -- 11:48:57

22 MR. DAY: Object to form. 11:48:58

1	A	Well, for certain -- I mean, for certain	11:48:59
2		receiver architectures and plans, it is not a good	11:49:05
3		thing; and for others it's completely irrelevant.	11:49:08
4		So it's -- I guess it depends.	11:49:10
5	Q	And in WiFi and Bluetooth -- strike that.	11:49:15
6		In order to meet WiFi and Bluetooth	11:49:17
7		standards, having a high second-order	11:49:19
8		intermodulation distortion, that would be a	11:49:22
9		problem. Right? You wouldn't be able to --	11:49:25
10		MR. DAY: Object to form.	11:49:27
11	Q	-- meet the standard?	11:49:28
12		MR. CHARKOW: Sorry, Evan, you have got	11:49:28
13		to let me finish my question.	11:49:30
14	Q	Go ahead.	11:49:34
15	A	I think I heard your question.	11:49:34
16	Q	Great.	11:49:35
17	A	Yeah. I mean I think, you know, once	11:49:37
18		again, it depends.	11:49:39
19		I mean, high second-order intermodulation	11:49:40
20		distortion is -- could be perfectly fine for	11:49:42
21		certain WiFi and Bluetooth receiver designs.	11:49:46
22	Q	And but it may not be perfectly -- it may	11:49:51

1	not be good for other receiver designs. Correct?	11:49:54
2	A And for other frequency plans it may not	11:49:57
3	be good.	11:49:59
4	Q And in the context of Bluetooth, what is	11:50:02
5	carrier-to-interference, or CI, ratio?	11:50:09
6	A So carrier-to-interference ratio is	11:50:18
7	the -- it's a measure of signal quality at the	11:50:22
8	output of the receiver. And the carrier is the	11:50:26
9	desired signal; and the I, or the interference, is	11:50:30
10	all the other stuff that you don't want.	11:50:39
11	And the specifications, typically --	11:50:44
12	Bluetooth or WiFi, typically have -- specify the	11:50:46
13	carrier-to-interference ratio to meet a certain	11:50:50
14	value in order to have a certain bit error rate.	11:50:54
15	Q So for Bluetooth or WiFi, if you don't	11:50:56
16	meet the carrier -- strike that.	11:50:59
17	So carrier-to-interference, or CI, ratio	11:51:01
18	has the same meaning in Bluetooth or WiFi.	11:51:05
19	Correct?	11:51:07
20	MR. DAY: Object to form.	11:51:10
21	A Well, I think they have the same kind of	11:51:11
22	overall meaning, although they might be defined	11:51:16

1 slightly differently.

11:51:19

2 So, you know, for example, WiFi has a
3 different bandwidth than Bluetooth. And so how
4 they are defined in detail will differ between
5 Bluetooth and WiFi.

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6 Q Okay.

11:51:31

7 A But from a general understanding, it's a
8 signal quality metric in both cases.

11:51:33

11:51:36

9 Q And so WiFi and Bluetooth, they both have
10 certain CI ratios that need to be met in order to
11 be compliant with the standard. Correct?

11:51:38

11:51:41

11:51:44

12 MR. DAY: Object to form.

11:51:47

13 A Yeah, I believe like all wireless
14 standards, you know, WiFi and Bluetooth specify C
15 over I to meet certain quality criteria.

11:51:50

11:51:52

11:51:56

16 Q And is a higher or lower CI ratio better?

11:51:57

17 MR. DAY: Object to form.

11:52:01

18 A Well, generally the higher the C over I,
19 the lower the bit error rate. However, you don't
20 necessarily want a super high C over I in all
21 cases, because that generally means you're wasting
22 some other resource in the network like bandwidth.

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1 So better is a -- in the context of the 11:52:30
2 system is a -- perhaps not the way -- best way to 11:52:34
3 express it. 11:52:37

4 A high C over I gives you a lower bit 11:52:37
5 error rate. But once again, you probably want to 11:52:40
6 trade that off against other important quality 11:52:44
7 network metrics. 11:52:46

8 Q And how does one achieve, or how does a 11:52:47
9 POSITA achieve a high C over I ratio for a WiFi 11:52:49
10 system? 11:52:53

11 MR. DAY: Object to form. 11:52:55

12 A Well, you would achieve a high C over I 11:52:58
13 by having a good sensitivity, good dynamic range, 11:53:03
14 and good frequency selectivity. All of those 11:53:14
15 things together, you know, that are instantiated 11:53:16
16 in the design of the receiver will give you a good 11:53:19
17 C over I. 11:53:22

18 Q And is -- that's the same answer for 11:53:22
19 Bluetooth as well? 11:53:27

20 A Yeah, those -- 11:53:30

21 MR. DAY: Object to form. 11:53:30

22 A -- those design considerations apply to 11:53:32

Transcript of Lawrence E. Larson, Ph.D.
Conducted on August 4, 2025

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1	all wireless systems, Bluetooth and WiFi.	11:53:34
2	MR. CHARKOW: All right. No further	11:53:38
3	questions at this time.	11:53:39
4	MR. DAY: Why don't we take like a very	11:53:48
5	short break. I mean, I don't think I have	11:53:50
6	redirect. But before I actually confirm, I just	11:53:53
7	want to, you know, confer with counsel before we	11:53:55
8	come back on the record to make sure.	11:53:58
9	MR. CHARKOW: Okay. How long? Let's go	11:54:01
10	off the record, and then tell me how long. Go off	11:54:03
11	the record, please.	11:54:05
12	MR. DAY: I would say five minutes.	11:54:08
13	VIDEO SPECIALIST: We are going off the	11:54:09
14	record. The time is 11:54 a.m.	11:54:10
15	(A recess was taken.)	11:54:13
16	VIDEO SPECIALIST: We are now back on the	11:57:52
17	record. The time is 11:59 a.m.	11:59:09
18	MR. DAY: All right. I have no questions	11:59:14
19	for petitioner.	11:59:17
20	We just want to note that we'll reserve	11:59:18
21	review and signature of the transcript for Dr.	11:59:21
22	Larson.	11:59:23

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Transcript of Lawrence E. Larson, Ph.D.
Conducted on August 4, 2025

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1 MR. CHARKOW: All right. Thank you, Dr. 11:59:25

2 Larson. I think we can go off the record. 11:59:27

3 VIDEO SPECIALIST: This marks the end of 11:59:29

4 the deposition. We are now going off record. The 11:59:32

5 time is 12:00 p.m. 11:59:34

6 (Off the record at 12:00 p.m. EST.)

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ACKNOWLEDGMENT OF DEPONENT

I, LAWRENCE E. LARSON, Ph.D., do hereby
acknowledge that I have read and examined the
foregoing testimony, and the same is a true,
correct and complete transcription of the
testimony given by me, and any corrections appear
on the attached Errata sheet signed by me.

(DATE)

(SIGNATURE)

C E R T I F I C A T E

I, Debra Ann Whitehead, E-Notary Public in and for
the Commonwealth of Virginia, do hereby certify:

That LAWRENCE E. LARSON, Ph.D., the
witness whose deposition is hereinbefore set forth,
was duly sworn by me before the commencement of such
deposition and that such deposition was taken
virtually and is a true record of the testimony
given by such witness.

I further certify that the adverse party,
MEDIATEK, INC., was represented by counsel at the
deposition.

I further certify that the deposition of
LAWRENCE E. LARSON, Ph.D., occurred virtually, on
Monday, August 4, 2025, from 10:15 a.m. to 12:00
p.m. EST.

1 I further certify that I am not related to
2 any of the parties to this action by blood or
3 marriage, I am not employed by or an attorney to any
4 of the parties to this action, and that I am in no
5 way interested, financially or otherwise, in the
6 outcome of this matter.

7
8 IN WITNESS WHEREOF, I have hereunto set my
9 hand this 4th day of August, 2025.

10
11 My commission expires:
12 October 31, 2027

13
14 *Debra Ann Whitehead*

15
16 -----
17 E-NOTARY PUBLIC IN AND FOR THE
18 COMMONWEALTH OF VIRGINIA

A	73:8, 73:9, 73:12 achieved 45:17 achieves 56:20 acknowledge 76:3 acknowledgment 76:1 action 78:2, 78:4 actions 16:9 actually 23:6, 43:14, 53:9, 62:13, 68:19, 74:6 additional 13:6, 51:11 address 53:19 adjusted 55:21 advantage 46:2, 46:22 advantages 27:10 adverse 77:12 affects 27:14, 27:16 afield 34:13 again 7:8, 10:14, 16:19, 31:17, 35:7, 37:8, 42:9, 46:21, 53:8, 70:18, 73:5 against 73:6 agree 10:10, 28:21, 29:1, 53:11 ahead 26:10, 37:20,	51:22, 70:14 all 5:11, 6:7, 6:12, 6:13, 11:10, 15:4, 16:9, 17:14, 20:20, 22:12, 25:13, 25:15, 27:2, 27:5, 27:21, 28:3, 28:10, 29:1, 29:4, 29:6, 29:14, 31:20, 32:5, 33:1, 35:2, 39:6, 41:15, 45:12, 46:2, 47:21, 50:1, 50:15, 56:10, 60:1, 61:16, 61:18, 62:1, 62:4, 62:8, 64:8, 64:14, 64:15, 65:9, 66:21, 67:7, 71:10, 72:13, 72:20, 73:14, 74:1, 74:2, 74:18, 75:1 allow 18:6, 19:15, 20:9, 23:2 allows 18:12, 21:2, 21:3, 49:14, 56:1 almost 64:17 aloud 21:3 already 33:21 also 3:20, 5:19, 7:6, 16:15, 21:8, 41:5, 48:19, 51:13, 59:15, 59:17	although 44:12, 66:18, 71:22 always 27:4, 55:12, 60:19, 65:6, 65:7 among 49:2 amount 18:7, 19:16, 19:20, 23:14, 39:17, 62:20 amounts 9:10, 9:16, 10:11, 10:17, 10:22, 11:6, 11:8, 20:9 amplified 16:8 amplifier 13:4 analog 31:20 ann 2:5, 77:2 another 30:1, 61:8, 64:13 answer 28:4, 63:8, 73:18 antenna 59:16 any 6:10, 15:3, 16:19, 16:20, 21:11, 36:13, 38:20, 43:21, 43:22, 48:12, 60:16, 61:18, 63:11, 76:6, 78:2, 78:3 anything 33:14 anyway 12:20 aperture 7:20, 7:22,
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