

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2 BEFORE THE PATENT TRIAL AND APPEAL BOARD

3 DEXCOM, INC.,)

)

4 Petitioner,)

)

5 vs.)

)

6 ABBOTT DIABETES CARE INC.)

)

7 Patent owner.)

8 Case IPR2023-01251

9 Patent 11,298,056 B2

10 DEPOSITION OF AARON STRIEGEL, PH.D.

11 Chicago, Illinois

12 Wednesday, July 24, 2024

13
14
15
16 Reported by:

17 JENNIFER L. BERNIER, CSR, RMR, CRR

18 JOB NO. J11372498

19
20
21
22
23
24 DEXCOM EXHIBIT 1054

Dexcom v. Abbott

IPR2023-01251

July 24, 2024

9:16 a.m.

The deposition of AARON STRIEGEL,
Ph.D., called as a witness herein for
examination, taken pursuant to the rules of the
Patent Trial and Appeal Board of the
United States Patent and Trademark Office
pertaining to the taking of depositions, taken
before Jennifer L. Bernier, a Certified
Stenographic Reporter of the State of Illinois,
CSR License No. 084-004190, Registered Merit
Reporter and Certified Realtime Reporter.

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

2 ON BEHALF OF THE PETITIONER:

3 KLARQUIST SPARKMAN, LLP, by
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5 TUCKER MOTTI, ESQ.
6 AMY HASPEL, ESQ. (Via teleconference)
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9 ON BEHALF OF THE PATENT OWNER:

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NO EXHIBITS MARKED.

(Witness sworn.)

AARON D. STRIEGEL, Ph.D.,
called as a witness, having been first duly
sworn, was examined and testified as follows:

EXAMINATION

BY MR. MASON:

Q. Good morning, Dr. Striegel. Can you
please state your full name for the record.

A. Sure. My name is Aaron
David Striegel.

Q. And what is your current occupation?

A. Currently, I'm a professor at the
University of Notre Dame in the department of
computer science and engineering.

Q. Great. And how long have you been
at Notre Dame?

A. I believe just over 20 years, so I
would have started in January 2003. So I guess
that's 21.

Q. Okay. Thanks.

Now, have you been deposed before?

A. I have.

Q. Okay. And how many times have you
testified at deposition?

A. So I believe over 10. I'd have to

1 go through and count them, but roughly just a 00:07

2 bit over 10. I think this is 11. 00:07

3 Q. 11, okay. And then when was the 00:08

4 last time you were deposed? 00:08

5 A. That's a good question. I think it 00:08

6 was last fall. 00:08

7 Q. Okay. And do you feel that you 00:08

8 understand the deposition process? 00:08

9 A. I do. 00:08

10 Q. Okay. And you feel comfortable with 00:08

11 the deposition process? 00:08

12 A. I do. 00:08

13 Q. Great. And can we agree that if you 00:08

14 don't understand any of my questions today, 00:08

15 you'll let me know? 00:08

16 A. Sure. 00:08

17 Q. Great. And -- 00:08

18 MR. HANSEN: Just one caveat there, 00:08

19 assuming that he realizes at the time that 00:08

20 he doesn't understand the question. 00:08

21 MR. MASON: Are you testifying for 00:08

22 the witness, Leland? 00:08

23 MR. HANSEN: No, I'm not testifying. 00:08

24 But I know what you're doing, Andy; and I 00:08

25 understand that he will have an opportunity 00:08

1 to review the transcript. And it's always 00:08
2 possible -- 00:08

3 MR. MASON: Oh, yeah. I'm not 00:08
4 asking to waive and sign -- 00:08

5 MR. HANSEN: -- that at a later 00:08
6 date, he might realize that he didn't 00:09
7 understand your question and that he didn't 00:09
8 ask -- or that he didn't appreciate the 00:09
9 fact at the moment that he didn't 00:09
10 understand the question. 00:09

11 So I just want the record to be 00:09
12 clear that we are not agreeing that just 00:09
13 because he doesn't ask you to clarify the 00:09
14 question, that he won't realize later that 00:09
15 he didn't understand the question. 00:09

16 BY MR. MASON: 00:09

17 Q. Do you agree to testify truthfully 00:09
18 today? 00:09

19 A. I do. 00:09

20 Q. Okay. And do you agree to testify 00:09
21 accurately today? 00:09

22 A. I do. 00:09

23 Q. Okay. And is there anything that 00:09
24 would impair or impede your ability to testify 00:09
25 truthfully? 00:09

1 A. No. 00:09

2 Q. Anything that would impede your 00:09

3 ability to testify accurately today? 00:09

4 A. No. 00:09

5 Q. Okay, great. 00:09

6 And we'll go over this, perhaps, 00:09

7 later, but do you understand that the rules of 00:09

8 the Patent Trial and Appeal Board forbid you 00:09

9 from talking to Abbott's counsel about the 00:09

10 substance of your deposition when we are on 00:09

11 break here today? 00:09

12 A. That's what I understand. 00:09

13 Q. Okay, great. 00:09

14 Do you agree to follow those rules? 00:09

15 A. I do. 00:09

16 Q. Okay, great. 00:10

17 And I see you have in front of you 00:10

18 there some documents or a couple binders, 00:10

19 Dr. Striegel; is that correct? 00:10

20 A. That's correct. 00:10

21 Q. And what are -- just briefly, what 00:10

22 is in the binder to your right? 00:10

23 A. Sure. So the binder to my right 00:10

24 has, I believe, the declaration, to make sure 00:10

25 I'm correct on the title. And then the binder 00:10

1	on the left has the various materials	00:10
2	considered --	00:10
3	Q. Right.	00:10
4	A. -- if I recall the parlance	00:10
5	correctly.	00:10
6	Q. Okay, great.	00:10
7	And then by declaration, are you	00:10
8	referring to Exhibit 2015 in this proceeding?	00:10
9	A. I'm not entirely sure of the	00:10
10	numbering --	00:10
11	Q. Okay.	00:10
12	A. -- for that, but it is my	00:10
13	declaration that I wrote.	00:10
14	Q. Okay. And it's your declaration	00:10
15	that you wrote and submitted in Case	00:10
16	No. IPR2023-01251, correct?	00:10
17	A. Yes, I believe that's the case.	00:10
18	MR. MASON: Okay. Leland, do you	00:10
19	mind if we just mark -- well, it's --	00:11
20	MR. HANSEN: Yeah.	00:11
21	MR. MASON: -- that -- actually, you	00:11
22	know what? I'll do -- for the reporter's	00:11
23	sake, so you have this, can I have you --	00:11
24	I'm going to hand the reporter what's been	00:11
25	marked as Exhibit 2015.	00:11

1 BY MR. MASON:

2 Q. Can you just confirm that's the same 00:11
3 thing that's in your binder that you're going 00:11
4 to be consulting here today? 00:11

5 A. Yes, I can confirm it. 00:15

6 Q. Okay, great. 00:15

7 You can reference either document 00:15
8 then, assuming they're the same. And the court 00:15
9 reporter will take that one on your right. 00:15

10 Was there a second tab in that first 00:15
11 binder that you opened that I noticed there? 00:15

12 A. There is. It is the -- there's 00:15
13 nothing behind it. 00:15

14 Q. Okay. 00:15

15 A. It was -- I believe on the document, 00:15
16 Appendices A and B were basically repeated as 00:15
17 separate attachments. 00:15

18 Q. Okay.

19 A. It was -- that was just a dump of 00:15
20 that. That was that same content. 00:15

21 Q. Great. 00:15

22 And then could I just have you, in 00:15
23 that -- the other binder you have with you, can 00:15
24 I just have you read the documents you have in 00:15
25 that larger binder so we know what you have 00:15

1 here?

00:16

2 A. So this would be on the front; and
3 I'll read the tab first, followed by the
4 exhibit number.

00:16

00:16

00:16

5 So Tab 1 is DexCom's petition for
6 inter partes -- I hope I won't pronounce
7 anything wrong -- review of U.S. PN 11,298,056.

00:16

00:16

00:16

8 Tab 2 is Abbott's patent owner's
9 preliminary response, POPR.

00:16

00:16

10 Tab 3 is decision granting
11 institution of inter partes review. And again,
12 I apologize if I'm not -- my Latin
13 pronunciation is not up to speed.

00:16

00:16

00:16

00:16

14 Tab 4 is Exhibit 1001, and that
15 would be U.S. 11,298,056.

00:16

00:16

16 Tab 5 is Exhibit 1008 titled "Gross
17 Declaration."

00:16

00:17

18 Tab 6 is 1011. Medtronic Paradigm
19 is listed under the description.

00:17

00:17

20 Tab 7 is Exhibit 1012 titled
21 "Patel -- P-A-T-E-L -- -2009."

00:17

00:17

22 Tab 8 is Exhibit 1015 titled
23 "Patel -- same as before -- -2008."

00:17

00:17

24 Tab 9 is Exhibit 1017 titled, I
25 believe, "Causey," C-A-U-S-E-Y.

00:17

00:17

1 Tab 10 is Exhibit 1019 titled 00:17

2 "Mastrototaro," M-A-S-T-R-O-T-O-T-A-R-O.

3 Tab 11 is Exhibit 1023 titled 00:18

4 "Shahmirian," S-H-A-H-M-I-R-I-A-N. 00:18

5 Tab 12 is Exhibit 2007 titled 00:18

6 "CareLink Personal Getting Started Guide." 00:18

7 Tab 13 is Exhibit 2018 titled 00:18

8 "Paradigm User Guide (for Pediatrics)." 00:18

9 Tab 13 -- oh, sorry. I just said 00:18

10 that. 00:18

11 Tab 14 is Exhibit 2033 titled 00:18

12 "Atmel -- A-T-M-E-L -- Product Guide 00:18

13 (Winter 2008) (Excerpt)." 00:18

14 Tab 15 is Exhibit 2034 titled 00:19

15 "Atmel -- same spelling as before -- dash, 00:19

16 ATmega169P Datasheet (Excerpt)." 00:19

17 And that would be the list. 00:19

18 Q. Did you consider all of these 00:19

19 documents in preparing your declaration? 00:19

20 A. I had gone through these documents 00:19

21 as part of my preparation for my declaration. 00:19

22 Q. And did you consider these documents 00:19

23 again in preparation for your deposition today? 00:19

24 A. I had looked through these documents 00:19

25 as part of my preparation. 00:19

1 Q. Okay. Turning back to your 00:19
2 declaration, Exhibit 2015 -- if I refer to your 00:19
3 declaration, can we understand that I'm 00:19
4 referring to Exhibit 2015 today? 00:19

5 A. Yes, we can agree on that. 00:19

6 Q. Great. Great. 00:20

7 Did you -- strike that. 00:20

8 When were you retained in this 00:20

9 matter? 00:20

10 A. So for this particular matter, I 00:20

11 don't recall the exact timeline. I had been 00:20

12 retained earlier related to other casework. I 00:20

13 don't recall the specific date for being 00:20

14 engaged just on this matter. 00:20

15 Q. And when you say engaged -- strike 00:20

16 that. 00:20

17 And when you say "retained related 00:20

18 to other casework," are you referring to other 00:20

19 casework involving this broader dispute between 00:20

20 Abbott and DexCom? 00:20

21 A. I believe that would be an accurate 00:20

22 characterization of it. 00:20

23 Q. Okay. And do you recall roughly 00:20

24 when -- the first time you were retained by the 00:20

25 McAndrews firm to represent Abbott in these 00:20

1 matters? 00:20

2 A. It was a couple of years back. I 00:20

3 don't recall the exact date when I would have 00:21

4 signed the engagement letter. 00:21

5 Q. Okay. And did you sign your 00:21

6 declaration on May 22nd, 2024? 00:21

7 A. Yes. That is the date that I listed 00:21

8 when I had signed my declaration. 00:21

9 Q. And that's on page 29 of your 00:21

10 declaration, correct? 00:21

11 A. That is correct. 00:21

12 Q. Okay. How long did you take to 00:21

13 prepare your declaration? 00:21

14 A. That is a good question. I don't 00:21

15 recall the exact number of hours without going 00:21

16 back through my notes. 00:21

17 Q. Okay. Is it more than five hours? 00:21

18 A. I couldn't say for sure. I would -- 00:21

19 I would definitely like to say that it was more 00:21

20 than five hours; but again, to be accurate, I 00:21

21 would have to go through my time sheets to try 00:22

22 to figure that out. 00:22

23 Q. Okay. Was it less than ten hours? 00:22

24 A. Again, I can't say for sure the 00:22

25 exact number, but I don't think it was less 00:22

1 than ten. 00:22

2 Q. Okay. Was it more than 20 hours? 00:22

3 A. As we get to higher numbers, I don't 00:22

4 know for sure, again, without looking through 00:22

5 my notes. 00:22

6 Q. Okay. And do you recall how long 00:22

7 prior to May 22nd, 2024 you began working on 00:22

8 this particular IPR? 00:22

9 A. Like I said, I don't recall the 00:22

10 exact time frame where I was, I guess you could 00:22

11 say, engaged on this matter. Yeah, again, I'd 00:22

12 have to look through my notes to figure out 00:22

13 when I had been contacted relative to when I 00:22

14 had started doing work specifically on this 00:22

15 IPR. 00:22

16 Q. Okay. Do you -- I mean, just 00:22

17 ballpark, was it more than two months prior to 00:22

18 signing your declaration? 00:23

19 A. That's a good question. I don't 00:23

20 know for sure. Our semesters tend to be fairly 00:23

21 busy; and with having kids, I wouldn't want to 00:23

22 speculate on the exact date. 00:23

23 Q. I can relate. 00:23

24 Did you review your -- oh, strike 00:23

25 that. 00:23

1 Roughly, how long did you spend 00:23
2 preparing for your deposition today? 00:23

3 A. Again, that's a good question. 00:23
4 Since it's been since May when I had submitted 00:23
5 it, again, I'd have to go through and tally the 00:23
6 exact time to have an accurate answer on that. 00:23

7 Q. Do you recall when you began 00:23
8 preparing for this deposition? 00:24

9 A. I believe I had been, in the back of 00:24
10 my mind, starting -- usually even after when I 00:24
11 submit the report, I try to spend a little bit 00:24
12 of time at least not -- not totally forgetting 00:24
13 the report. So it would have been reviewing 00:24
14 it, even a bit after I had submitted the 00:24
15 report, to occasionally refresh myself. 00:24

16 Q. And so between May 22nd and today 00:24
17 you've been preparing for your deposition? Is 00:24
18 that fair to say? 00:24

19 A. In the sense that I have been 00:24
20 occasionally browsing through those things; but 00:24
21 I would say in terms of more intensive 00:24
22 preparation, that would have been more recent. 00:24

23 Q. Okay. And when did the more 00:24
24 intensive preparation begin? 00:24

25 A. I would say probably sometime in 00:24

1 July. I don't recall when -- it would have 00:25
2 been after I had gotten back from traveling and 00:25
3 then finding time here and there. 00:25

4 Q. And when did you return from 00:25
5 traveling? 00:25

6 A. I would have returned from traveling 00:25
7 on July 7th. 00:25

8 Q. And did you meet with anybody in 00:25
9 preparation for your deposition? 00:25

10 A. I did. 00:25

11 Q. Yeah. And who did you meet with? 00:25
12 And I'm not asking for the content or substance 00:25
13 of any communications, just who did you meet 00:25
14 with? 00:25

15 A. I had the opportunity to meet with 00:25
16 my counsel that is here, in addition to 00:25
17 Mr. Carrozza, C-A-R-R-O-Z-Z-A -- and my 00:25
18 apologies to Mike if I misspelled it -- and 00:25
19 then Dr. Wright. 00:25

20 Q. When did you meet with Dr. Wright? 00:26

21 A. I would have met with him the first 00:26
22 time yesterday. 00:26

23 Q. And did you speak with Dr. Wright 00:26
24 before yesterday? 00:26

25 A. To the best of my knowledge, I had 00:26

1 not. 00:26

2 Q. And maybe I should clarify that. 00:26

3 Did you have any communications with Dr. Wright 00:26

4 directly prior to yesterday? 00:26

5 A. I had not spoken directly with 00:26

6 Dr. Wright prior to yesterday. 00:26

7 Q. And how long did you meet with 00:26

8 Dr. Wright yesterday? 00:26

9 A. It was not a long chat; but I would 00:26

10 say it was more than five minutes, but not the 00:26

11 entire time. 00:26

12 Q. And when you say the "entire time," 00:26

13 what was the entire time? 00:26

14 A. I believe we had done part of the 00:26

15 preparation yesterday afternoon, primarily. 00:26

16 Q. But -- yeah, what time yesterday did 00:27

17 you begin your depo preparation here at 00:27

18 McAndrews? 00:27

19 A. So in terms of my deposition 00:27

20 preparation here at McAndrews, I would have 00:27

21 gotten here I think a bit before noon; and then 00:27

22 we went until late afternoon. 00:27

23 Q. And was Dr. Wright present that 00:27

24 entire time? 00:27

25 A. No, he was not. 00:27

1 Q. And you said that he was present for 00:27
2 more than five minutes; is that correct? 00:27

3 A. Yes, more than -- more than five 00:27
4 minutes; but to put an upper bound on it would 00:27
5 be harder. It was certainly not the majority 00:27
6 of the time. 00:27

7 Q. And did you review any documents 00:27
8 with Dr. Wright? 00:27

9 A. I believe we had my report, as well 00:27
10 as some of the exhibits as part of broader 00:28
11 discussions related to the preparation. 00:28

12 Q. Did you review any documents with 00:28
13 Dr. Wright other than the exhibits that you 00:28
14 have in front of you here today? 00:28

15 A. To the best of my knowledge, no. 00:28

16 Q. Since signing your report, have you 00:28
17 identified any errors in it? 00:29

18 A. Outside of reviewing it and seeing a 00:29
19 couple of misspelled words, which always pains 00:29
20 me a little bit, no. 00:29

21 Q. Did you meet with anybody from 00:29
22 Abbott in preparing your declaration? 00:29

23 A. I did not. 00:29

24 Q. Okay. Did you meet with anyone at 00:29
25 Abbott in preparation for this deposition? 00:29

1 A. No. 00:29

2 Q. Have you ever met Wesley 00:29

3 Scott Harper, the first named inventor on the 00:29

4 '056 patent? 00:29

5 A. That name doesn't ring a bell 00:29

6 outside of being on the -- on the patent. I 00:29

7 have not. 00:29

8 Q. Your face suggested as much. 00:29

9 Okay. Can I have you turn to 00:29

10 paragraph 23 of your declaration? 00:29

11 A. Sure. 00:29

12 Q. And beginning on page 23, do you 00:30

13 discuss the level of ordinary skill in the art 00:30

14 with respect to the '056 patent? 00:30

15 A. I believe, counsel, you're referring 00:30

16 to paragraph 23? 00:30

17 Q. Paragraph 23, yeah. Beginning on 00:30

18 paragraph -- strike that. 00:30

19 Beginning on paragraph 23, do you 00:30

20 discuss the level of ordinary skill in the art 00:30

21 with respect to the '056 patent? 00:30

22 A. I do see in paragraph 23 that I 00:30

23 offer -- I basically excerpt from Mr. Gross's 00:30

24 report the level of ordinary skill in the art, 00:30

25 and then I continue with my opinion and 00:30

1 discussion later in that same section. 00:30

2 Q. And if we use the term "POSA" today, 00:30

3 do you understand that to refer to a person of 00:31

4 ordinary skill in the art? 00:31

5 A. I do, for both POSITA, P-O-S-I-T-A, 00:31

6 and POSA. But it would be okay to use them 00:31

7 interchangeably, I think; but I'm not a lawyer. 00:31

8 So... 00:31

9 Q. Great. Yeah, no, that was my next 00:31

10 question. Can we use both those terms, POSA 00:31

11 and POSITA, interchangeably to refer to a 00:31

12 person of ordinary skill in the art? 00:31

13 A. Sure. 00:31

14 Q. Great. 00:31

15 Have you reviewed -- strike that. 00:31

16 And you have reviewed Mr. Gross's 00:31

17 declaration, correct? 00:31

18 A. Yes, I have seen and gone through 00:31

19 his declaration. 00:31

20 Q. And in your opinion, is Mr. Gross a 00:31

21 POSA? 00:31

22 A. I did not offer an opinion as to 00:31

23 whether Mr. Gross was a POSA in my report. 00:31

24 Q. Okay. So you have no opinion on 00:31

25 whether Mr. Gross is a POSA; is that correct? 00:32

1	A. I did not offer an opinion in my	00:32
2	report.	00:32

3	Q. Do you agree with Mr. Gross's	00:32
4	definition of a POSA as you lay it out in	00:32
5	paragraph 23?	00:32

6	A. So just to clarify, paragraph 23 is	00:32
7	from Mr. Gross's report. In that case, I am	00:32
8	simply excerpting from his report to take his	00:32
9	definition of a POSA. I do offer additional	00:32
10	discussion on paragraph 25 with regards to a	00:32
11	POSA.	00:32

12	Q. Do you agree with Mr. Gross's	00:32
13	definition of a POSA as you excerpt it in	00:32
14	paragraph 23?	00:32

15	A. I have some quibbles with	00:32
16	Mr. Gross's definition in that I believe	00:33
17	Mr. Gross had said that it may require an	00:33
18	interdisciplinary team; whereas in my opinion,	00:33
19	I felt, given the subject matter, that it would	00:33
20	necessarily require an interdisciplinary team.	00:33

21	Q. And what about the subject matter	00:33
22	would -- would dictate the need for an	00:33
23	interdisciplinary team?	00:33

24	A. Sure. So as I state in my report, I	00:33
25	believe that a POSA would require an	00:33

1 interdisciplinary team that includes a 00:33
2 clinician. 00:33

3 Q. Are you a clinician? 00:33

4 A. As I state in the next paragraph, I 00:33
5 am not. 00:33

6 Q. Mm-hmm. And at the end of 00:33
7 paragraph 25, by that phrase "a POSA would 00:33
8 require an interdisciplinary team," are you 00:34
9 meaning to state that the POSA would need to be 00:34
10 informed by other members of that team? 00:34

11 A. So if I understand your question 00:34
12 correctly, what I was trying to state here was 00:34
13 that a POSA would -- would require basically to 00:34
14 be part of an interdisciplinary team that would 00:34
15 include a clinician. 00:34

16 Q. And would that interdisciplinary 00:34
17 team require any other team members? 00:34

18 A. It possibly could. In this case, I 00:34
19 only opined on that I felt it would be 00:34
20 appropriate -- or very much a requirement to 00:35
21 have a clinician on the team as well. 00:35

22 Q. In your opinion, would the 00:35
23 interdisciplinary team, as you've mentioned it 00:35
24 in paragraph 25 of your declaration, require 00:35
25 somebody with embedded systems experience? 00:35

1 A. In this case, I commented that this 00:35
2 additional team member would complement 00:35
3 expertise, referring to my own, talking about 00:35
4 radio communications and embedded systems. 00:35

5 Q. And so in your opinion, expertise -- 00:35
6 strike that. 00:35

7 In your opinion, experience with 00:35
8 radio communications and embedded systems would 00:35
9 also be required, then? 00:35

10 A. It would be required, given that 00:36
11 there are wireless communications going on, as 00:36
12 well as knowledge of embedded systems. And as 00:36
13 part of a team, there could be various members 00:36
14 which are contributing said expertise. 00:36

15 Q. And in 2009, were you at least a 00:36
16 POSA? 00:36

17 A. I describe that in paragraph 24, 00:36
18 that, yes, I would consider myself to be a POSA 00:36
19 based on my experience in Bluetooth, Wi-Fi, 00:36
20 radio communications, and embedded systems. 00:36

21 Q. And so -- yeah, and I just want to 00:36
22 clarify. Because I think in paragraph 24, you 00:36
23 state that you have the requisite education and 00:36
24 training according to Mr. Gross's definition of 00:36
25 a POSA; is that correct? 00:36

1	A. That is correct.	00:36
---	---------------------	-------

2	Q. Okay. And so under your definition	00:36
---	---------------------------------------	-------

3	of a POSA, were you at least a POSA in 2009?	00:36
---	--	-------

4	A. So as I describe in my later	00:36
---	---------------------------------	-------

5	paragraph, I would have needed to be part of an	00:37
---	---	-------

6	interdisciplinary team that would include a	00:37
---	---	-------

7	clinician.	00:37
---	------------	-------

8	Q. And is it true that you don't have	00:37
---	---------------------------------------	-------

9	any opinions on what other team members might	00:37
---	---	-------

10	be required as part of that interdisciplinary	00:37
----	---	-------

11	team?	00:37
----	-------	-------

12	MR. HANSEN: Objection as to form.	00:37
----	-----------------------------------	-------

13	THE WITNESS: I talked about in this	00:37
----	-------------------------------------	-------

14	case that it would require an	00:37
----	-------------------------------	-------

15	interdisciplinary team, but I did not	00:37
----	---------------------------------------	-------

16	expand in significant detail on the exact	00:37
----	---	-------

17	makeup of the team.	00:37
----	---------------------	-------

18	BY MR. MASON:	00:37
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19	Q. Other than a clinician and somebody	00:37
----	--	-------

20	with wireless and embedded system experience,	00:37
----	---	-------

21	would your interdisciplinary team require any	00:37
----	---	-------

22	other team members or experience?	00:37
----	-----------------------------------	-------

23	A. Yes. I believe it would have	00:37
----	---------------------------------	-------

24	additional -- additional expertise required as	00:38
----	--	-------

25	part of the team, subject to what the expertise	00:38
----	---	-------

1 of the clinician might be and also subject to 00:38
2 what the particular expert in, say, radio 00:38
3 communications and embedded systems, their 00:38
4 expertise that it -- it would be necessarily a 00:38
5 requirement to have an interdisciplinary team 00:38
6 to cover all of the relevant aspects. 00:38

7 Q. And any other expertise that would 00:38
8 be needed as part of this interdisciplinary 00:38
9 team? 00:38

10 A. I did not offer a specific 00:38
11 commentary with regards to enumerating the 00:38
12 various skills that would be required for the 00:38
13 broader interdisciplinary team. 00:38

14 Q. And in reaching these opinions, you 00:38
15 considered the '056 patent; is that correct? 00:39

16 A. I believe as a matter of law -- and 00:39
17 again, I'm not a lawyer -- that when 00:39
18 considering what a POSA would be, one would do 00:39
19 that in the context of the patent. 00:39

20 Q. And you did that in the context of 00:39
21 the '056 patent when forming your opinions on a 00:39
22 POSA? 00:39

23 A. I believe that's how it would work, 00:39
24 yes. 00:39

25 Q. But is that how it worked here? 00:39

1 A. To the extent as I understood the 00:39
2 process, yes. 00:39

3 Q. Yes, okay. Yeah. And all I'm just 00:39
4 trying to figure out here is what -- what areas 00:39
5 of expertise you bring to the table with 00:39
6 respect to the '056 patent, so if -- to the 00:39
7 extent that helps -- strike that. 00:39

8 Okay. So do you believe you're an 00:39
9 expert in the subject matter of the '056 00:39
10 patent? 00:40

11 A. Well, as I described on here, I'm 00:40
12 well-versed with Bluetooth, Wi-Fi, radio 00:40
13 communications, and embedded systems. And 00:40
14 again, as I described, it would be to kind of 00:40
15 fully grasp the '056 patent that you would need 00:40
16 to be part of an interdisciplinary team. So I 00:40
17 would bring my relevant expertise for the 00:40
18 matter that I opined on as related to the '056 00:40
19 patent. 00:40

20 Q. And just can I have you turn, 00:40
21 please, to paragraph 27 on page 12 of your 00:40
22 declaration? 00:40

23 A. I got it. 00:40

24 Q. Great. And you see there this is a 00:40
25 listing of claim 1 of the '056 patent; is that 00:40

1 correct? 00:40

2 A. I do see that I wrote that 00:40

3 paragraph 27. 00:41

4 Q. And when I refer to the '056 patent, 00:41

5 do you understand that I'm referring to 00:41

6 Exhibit 1001 in this case, correct? 00:41

7 A. I will take your word for it, 00:41

8 counsel, on the -- on the numbering. 00:41

9 Q. Okay. And just for clarity, when I 00:41

10 refer to the '056 patent, that's U.S. Patent 00:41

11 No. 11,298,056. Can we agree on that 00:41

12 understanding? 00:41

13 A. Since we have only one patent to 00:41

14 discuss here, yes, counsel. 00:41

15 Q. And then, so do you -- in 2009, were 00:41

16 you familiar with glucose monitoring systems? 00:41

17 A. In 2009, I would have had, as I 00:41

18 described earlier, expertise with regards to 00:41

19 wireless communications and embedded systems. 00:41

20 But in 2009, I had not been working on glucose 00:42

21 monitoring systems. 00:42

22 Q. And then at any subsequent point in 00:42

23 time, did you work on glucose monitoring 00:42

24 systems? 00:42

25 A. As part of my research team, we had 00:42

1 explored some relationships with regards to 00:42
2 potentially using glucose monitoring for part 00:42
3 of our studies. But I had not worked directly 00:42
4 on a glucose monitoring system. 00:42

5 Q. Okay. In 2009, did you have 00:42
6 experience with glucose sensors? 00:42

7 A. In 2009, I had not worked with 00:42
8 glucose sensors. 00:42

9 Q. In 2009, were you familiar with data 00:42
10 processing and transmitter units? 00:42

11 A. In 2009, I would have been familiar 00:42
12 with those terms. 00:43

13 Q. And had you worked with data 00:43
14 transmit -- well, strike that. 00:43

15 In 2009, had you worked with data 00:43
16 processing and transmitter units? 00:43

17 A. Yes, I had. 00:43

18 Q. Okay. Did that have a known meaning 00:43
19 in the art at that time, that phrase, data 00:43
20 processing and transmitter unit? 00:43

21 A. I would say yes, what we might use 00:43
22 in academia or what we might use in the 00:43
23 classroom versus what this would be. But a 00:43
24 POSA and myself would certainly understand, if 00:43
25 you said data processing and transmitter unit, 00:43

1 what it would mean. 00:43

2 Q. Okay. And in 2009, had you had 00:43
3 experience with data processing and transmitter 00:43
4 units that included a power supply, a 00:43
5 processor, and memory? 00:43

6 A. Yes, I have. 00:43

7 Q. Okay. And in 2009, had you -- 00:43
8 strike that. 00:44

9 In 2009, did you have experience 00:44
10 with data processing transmitter units that 00:44
11 included a power supply, processor, memory, and 00:44
12 a radio frequency transceiver? 00:44

13 A. Yes, I had. 00:44

14 Q. Okay. Did you teach on those -- 00:44
15 strike that. 00:44

16 Did you teach on data processing and 00:44
17 transmitter units of that type in 2009? 00:44

18 MR. HANSEN: Objection as to form. 00:44

19 THE WITNESS: What do you mean by 00:44
20 "of that type"? 00:44

21 BY MR. MASON: 00:44

22 Q. Okay. Yeah, strike that. 00:44

23 Yeah, and in your -- were you a 00:44
24 professor in 2009? 00:44

25 A. I was. 00:44

1 Q. Okay. Then did your coursework for 00:44
2 your students at that time include discussion 00:44
3 of data processing and transmitter units that 00:44
4 had power supply, a processor, memory, and a 00:44
5 radio frequency transceiver? 00:44

6 MR. HANSEN: Objection as to form. 00:44

7 THE WITNESS: I would have taught 00:44
8 courses, in that time and before that, that 00:45
9 would have included many, if not all, of 00:45
10 those components. 00:45

11 BY MR. MASON: 00:45

12 Q. Mm-hmm. Okay. 00:45

13 And this was -- strike that. 00:45

14 When you say "courses," are you 00:45
15 referring to undergraduate courses? 00:45

16 A. There would have been -- this is 00:45
17 testing my memory. I believe most of the 00:45
18 courses that I have taught on embedded systems 00:45
19 would have been at the undergraduate level. 00:45

20 Q. Okay. And when you say "embedded 00:45
21 systems," that would have encompassed the types 00:45
22 of data processing and transmitter units 00:45
23 recited here in claim element 1.C of 00:45
24 paragraph 27 of your declaration; is that 00:45
25 correct? 00:45

1 MR. HANSEN: Objection as to form. 00:45

2 THE WITNESS: It would have included 00:45

3 data processing, transmitters, radio 00:45

4 frequency transceivers, as those various 00:46

5 subjects would all have been very important 00:46

6 to an embedded systems class. 00:46

7 BY MR. MASON: 00:46

8 Q. Okay. 00:46

9 A. Oh, and also power supplies, of 00:46

10 course, as well. 00:46

11 Q. Okay. And these embedded systems 00:46

12 that you taught your undergraduates about in 00:46

13 2009, did they receive data and store that 00:46

14 data? 00:46

15 A. Generally speaking, an embedded 00:46

16 systems class would cover communications which 00:46

17 would involve the receipt and, often, 00:46

18 transmission of data. 00:47

19 Q. Okay. And these embedded systems 00:47

20 that you taught your undergraduates about in 00:47

21 2009, did they perform some kind of processing 00:47

22 on that data that they received? 00:47

23 A. So to -- to clarify, these would 00:47

24 have been courses -- I want to be sure that 00:47

25 we're not just restricting ourselves to 2009, 00:47

1 as I taught courses in years prior and years 00:47
2 since. They would have typically involved some 00:47
3 sort of processing because that would have been 00:47
4 related to why you would do the communications 00:47
5 in the first place. 00:47

6 Q. Okay. And in that 2009 or earlier 00:47
7 time frame, did you teach undergraduates about 00:47
8 using Bluetooth communications for or within 00:47
9 these embedded systems? 00:47

10 A. I believe I would have covered 00:48
11 broadly how Bluetooth would have worked as part 00:48
12 of that, but I would have to go back and look 00:48
13 at my notes whether I covered wireless more 00:48
14 broadly and whether I included specific modules 00:48
15 on Bluetooth at the time. 00:48

16 Q. Would you expect your undergraduate 00:48
17 students to have knowledge of Bluetooth in that 00:48
18 2009 time frame? 00:48

19 A. Yes. I would have expected that 00:48
20 they would have either experienced Bluetooth 00:48
21 from using it or we might have covered it as 00:48
22 one of the potential wireless technologies that 00:48
23 you might use in an embedded system. 00:48

24 Q. And did you work with graduate 00:48
25 students in the 2008 or 2009 time frame? 00:49

1 A. I would have been, I would say,
2 working with graduate students from when I
3 started my Ph.D. pretty much up until
4 currently. So yes, I would have been working
5 with graduate students during that time frame.

00:49

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6 Q. And so prior to -- prior to 2009,
7 would you have expected a graduate student
8 beginning, you know, a program, for example, at
9 Notre Dame to have had experience implementing
10 Bluetooth to send and receive data in an
11 embedded system environment?

00:49

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00:49

12 A. I would not have necessarily
13 expected a graduate student to have had that
14 experience.

00:49

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00:49

15 Q. And would you have expected a
16 graduate student to know about the use of
17 Bluetooth communications within embedded
18 systems?

00:49

00:49

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00:50

19 A. So thinking towards 2009, if I'm
20 understanding your question, they might have
21 known about Bluetooth; but I don't know if we
22 would have had that expectation.

00:50

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23 And also, just to clarify a bit
24 earlier, the class that I had taught on an
25 embedded system -- on embedded systems was an

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00:50

00:50

1 elective. So it was not required of all of our 00:50
2 undergraduates, so it would have been a subset 00:50
3 of our students that would have taken my 00:50
4 embedded systems class versus all of our 00:50
5 undergraduate population. 00:50

6 Q. And was that the title of that 00:50
7 class? Or the rough title of that class was 00:50
8 "embedded systems" in 2009 and earlier? 00:50

9 A. I could look that up on my CV. I 00:50
10 don't think we called it embedded systems. I 00:50
11 think that's a more recent title that we've 00:50
12 used on a course. I think we called it 00:50
13 "computer system design" -- 00:50

14 Q. Okay. 00:51

15 A. -- which ended up being embedded 00:51
16 systems, but also other aspects as well. 00:51

17 Q. Got it, okay. 00:51

18 And would you expect somebody who 00:51
19 was going on to work in computer system design 00:51
20 or embedded systems to have taken your -- your 00:51
21 course on embedded systems? 00:51

22 A. Not necessarily, given that an 00:51
23 undergraduate would have many choices. Some of 00:51
24 them would have recognized that they wanted to 00:51
25 take the class, and others may recognize later, 00:51

1 as they start in the workforce, that they wish
2 they would have taken that class afterwards.

3 So I don't think it would be
4 necessarily that only students that took my
5 class would work in that area. It could be
6 other students. Some of our computer engineers
7 from our department might have more hardware
8 experience. Those would be the more likely
9 students I would possibly envision as taking
10 that, but it wouldn't be just restricted just
11 to -- just to my students.

12 Q. Okay. And in 2009, these embedded
13 systems that you were teaching to undergrads,
14 did they include displays that would output
15 information to a user?

16 A. Not necessarily. For -- and this
17 still holds true today -- many embedded systems
18 can be what's called "headless," where they do
19 not have a display or they have a very kind of
20 rudimentary form of output, like a flashing LED
21 or something without an actual, say, LCD
22 display or LED display or other mechanism. It
23 may be just other ways that it communicates or
24 even not really any way at all outside of a
25 power light to know that it's on.

1 Q. Okay. But were -- were displays 00:52
2 fairly conventional in embedded systems in 00:53
3 2009? 00:53

4 A. I'm not sure what you mean by 00:53
5 "conventional." Is that -- what does -- 00:53

6 Q. Well, yeah, strike that. I'll 00:53
7 strike that question. 00:53

8 Were displays like fairly well-known 00:53
9 within embedded systems in 2009? 00:53

10 A. I guess I would say there are -- 00:53
11 there are many different ways to do potential 00:53
12 output where you might interact or show things 00:53
13 to a user. Almost all embedded systems involve 00:53
14 some sort of trade-off. And then trying to 00:53
15 figure out what the right balance of power, 00:53
16 computation, lifetime -- we call it the good 00:53
17 kind of -- you know, you have three things you 00:53
18 can optimize, pick two; or trying to figure out 00:53
19 how you size a system right. 00:53

20 So a display could be a very strong 00:53
21 or, I guess you could say, limiting component 00:53
22 on your design because they -- oftentimes tends 00:53
23 to be very power intensive. And there is -- 00:54
24 kind of considering the different technologies 00:54
25 and choices you might make, all of those play a 00:54

1 role together in getting back to things like 00:54

2 power, computational capabilities and cost. 00:54

3 Someone working in embedded systems would have 00:54

4 to try to kind of balance those sort of things. 00:54

5 Q. Would ordinarily skilled embedded 00:54

6 system designers in 2009 know -- know how to 00:54

7 implement a display within an embedded system? 00:54

8 A. So if we look at the -- the 00:54

9 definition of a POSA, which we had talked about 00:54

10 before, I would say the odds are reasonably 00:54

11 good that they would be aware of displays. But 00:54

12 again, given the context where they might be 00:54

13 working and they might only be working on 00:55

14 headless units, so may not need to ever deal 00:55

15 with displays. 00:55

16 Q. Would you expect them to be able to 00:55

17 implement a display if needed? 00:55

18 A. I would expect that, given much the 00:55

19 technology, say, circa 2009, that they could 00:55

20 probably figure it out or -- or read the 00:55

21 documentation to try to understand. 00:55

22 There is some nuance on displays 00:55

23 sometimes on how you might interface with them 00:55

24 that might require additional knowledge, but 00:55

25 there were also some displays that were easier 00:55

1 to use that were -- would have existed in 2009,
2 as well as today, that they could have looked
3 at.

4 But it becomes very situational
5 dependent. Sometimes you need the more exotic
6 ones to try to meet some of the constraints you
7 have in a particular environment.

8 Q. Had you worked on embedded systems
9 that had displays prior to 2009?

10 A. Yes. I would have worked on both
11 systems with and without displays, both in 2009
12 and prior.

13 Q. Okay. When was the first time you
14 worked on an embedded system with a display?

15 A. So the first time I would have
16 worked on an embedded system with a display
17 would have been -- I guess, depending upon what
18 you consider worked, it would have been during
19 my undergraduate time. During my undergraduate
20 work, we had some embedded systems labs as part
21 of our curriculum that had LCD displays as part
22 of it.

23 Q. Okay. Had you worked, prior to
24 2009, on any embedded systems with LCD displays
25 that provided graphical information?

1 MR. HANSEN: Objection as to form. 00:57

2 THE WITNESS: So I want to be a 00:57

3 little bit specific. So on graphical 00:57

4 displays, depending upon the kind of 00:57

5 display, some will just allow you to output 00:57

6 ASCII, A-S-C-I-I, letters where you have 00:57

7 only that choices; and some will sometimes 00:57

8 allow you to take kind of the equivalent of 00:57

9 pixels and try to map them. So the -- it 00:57

10 depends on kind of what you call a 00:57

11 graphical display, if I'm lighting it on or 00:57

12 off and kind of what constitutes a graphic. 00:58

13 Under a broader definition of what 00:58

14 constitutes graphics, I would have worked 00:58

15 on kind of both kinds of those displays, if 00:58

16 you will, and both ones that have just 00:58

17 letters and numbers, kind of your standard 00:58

18 character output, as well as ones where you 00:58

19 might have a little bit more of an ability 00:58

20 to, perhaps, select which pixels you might 00:58

21 light up as well too. 00:58

22 BY MR. MASON: 00:58

23 Q. Okay. And would you expect a POSA 00:58

24 in 2009 to be able to implement an LCD display 00:58

25 in an embedded system that displayed graphics? 00:58

1 MR. HANSEN: Andy, I've been giving 00:58
2 you a fair amount of leeway. But as you 00:58
3 know, the scope of this deposition is 00:58
4 limited as cross-examination of 00:58
5 Dr. Striegel with respect to his 00:59
6 declaration. 00:59

7 It seems that for some time here, 00:59
8 you have been asking questions that don't 00:59
9 relate to his declaration and to the 00:59
10 testimony in his declaration. So I'm going 00:59
11 to encourage you to move on, or we're going 00:59
12 to have to figure -- stop and figure this 00:59
13 out. 00:59

14 MR. MASON: Okay. 00:59

15 BY MR. MASON: 00:59

16 Q. Did you understand -- 00:59

17 MR. MASON: Could you repeat the 00:59
18 question, Jennifer? 00:59

19 MR. HANSEN: Okay. If all you're 00:59
20 going to do is repeat the question and ask 00:59
21 him to answer the same question, then I 00:59
22 think we are going to need to stop and sort 00:59
23 this out. 00:59

24 MR. MASON: Well, again -- let's go 00:59
25 off the record. Actually, let's not go off 00:59

1 the record right yet. 00:59

2 BY MR. MASON:

3 Q. There is a question pending. Are 00:59

4 you going to answer the question or -- 00:59

5 A. I believe, given the objection of 00:59

6 counsel and asked to sort it out, I will defer 00:59

7 to both of you as the counsels of record. 00:59

8 MR. MASON: Okay. Jennifer, could 00:59

9 you repeat the question? 01:00

10 (Record read as requested.) 01:00

11 THE WITNESS: I will defer to my 01:00

12 counsel's objection and wait until that's 01:00

13 resolved. 01:00

14 BY MR. MASON: 01:00

15 Q. And so you're -- you're not going to 01:00

16 answer the question; am I correct? 01:00

17 A. I will wait until it's resolved 01:00

18 and -- or to whatever the resolution should be 01:00

19 for that, for answering that question. 01:00

20 Q. There is a question pending. Are 01:00

21 you going to answer the question? 01:00

22 MR. HANSEN: Okay. We're going to 01:00

23 stop. We're going to stop the deposition, 01:00

24 and so that we can seek an appropriate 01:00

25 protective order. So this will be it. 01:00

1 MR. MASON: Leland, I'm asking -- 01:00
2 element 1.K, he says: I have been asked to 01:01
3 focus on element 1.K for purposes of this 01:01
4 declaration. 01:01
5 That involves outputting things to 01:01
6 the display. The claim recites: The 01:01
7 receiver unit is configured to output to 01:01
8 the display. I'm asking him about a POSA's 01:01
9 knowledge on outputting to the display -- 01:01
10 MR. HANSEN: No. You're asking -- 01:01
11 you are asking him questions that are 01:01
12 directed to enablement, which isn't an 01:01
13 issue in -- 01:01
14 MR. MASON: I'm asking what was 01:01
15 known in the art. 01:01
16 MR. HANSEN: No. You're asking what 01:01
17 a POSA would be able to do. You're not 01:01
18 asking him what would be known. You're 01:01
19 asking him questions that are clearly 01:01
20 directed to enablement, which is not within 01:01
21 the scope of an inter partes review 01:01
22 proceeding. 01:01
23 And if you're going to persist in 01:01
24 asking these questions, then we're going to 01:01
25 stop. 01:01

1 MR. MASON: That is your 01:01
2 understanding. 01:01

3 MR. HANSEN: Well, I've been 01:01
4 watching the display. You keep asking what 01:01
5 would they be able to do. You haven't been 01:01
6 asking what would they know. You've been 01:01
7 asking what would they be able to do; would 01:01
8 they be able to do this, would they be able 01:02
9 to do that. 01:02

10 These are enablement questions that 01:02
11 you have been persisting in asking for some 01:02
12 time now. If we need to take this up with 01:02
13 the panel and let them look at the 01:02
14 transcript and see the nature of the 01:02
15 questions that are clearly outside the 01:02
16 scope of not only his declaration, but 01:02
17 outside the scope of this proceeding, then 01:02
18 we'll do so. 01:02

19 MR. MASON: Yeah. Well, these 01:02
20 questions aren't -- I mean, they're going 01:02
21 to what a skilled art is and what a POSA 01:02
22 would have been able to do. 01:02

23 MR. HANSEN: Which goes directly 01:02
24 to -- 01:02

25 MR. MASON: It's acknowledging 01:02

1 skills -- this is -- 01:02

2 Their knowledge and skills are 01:02

3 directly applicable to whether claims would 01:02

4 have been obvious or not, whether someone 01:02

5 would have found it obvious to implement a 01:02

6 particular system. 01:02

7 You may view it as enablement. This 01:02

8 is clearly tied to obviousness of the 01:02

9 claims. So, I mean -- 01:02

10 MR. HANSEN: And it's -- and I don't 01:02

11 think -- [cross-talk] 01:02

12 MR. MASON: -- but yeah, so I just 01:02

13 want to clarify. 01:02

14 Are you instructing the witness not 01:02

15 to answer? 01:02

16 MR. HANSEN: No, I'm not instructing 01:02

17 the witness not to answer. I'm -- 01:02

18 MR. MASON: Okay. Then let the 01:02

19 witness answer the question. 01:03

20 MR. HANSEN: No. No. I'm stopping 01:03

21 the deposition so that we can seek an 01:03

22 appropriate protective order. 01:03

23 MR. MASON: All right. I guess 01:03

24 we --

25 Let's go off the record, Jennifer. 01:03

1	(Recess had.)	01:03
2	MR. MASON: Let's go back on the	
3	record.	01:16
4	BY MR. MASON:	01:16
5	Q. Could you turn to paragraph 15 of	01:16
6	your declaration?	01:16
7	A. Which page number is that, counsel?	01:16
8	Q. Paragraph 15 is on page 6.	01:16
9	A. Yes, I see that.	01:16
10	Q. And in paragraph 15, the second	01:16
11	sentence, you refer to, quote, medical-sensing	01:16
12	technology?	01:16
13	A. I do list the term medical-sensing	01:16
14	technology.	01:16
15	Q. Okay. And what do you -- here,	01:16
16	you -- are you just -- strike that.	01:16
17	What -- and is it your opinion that	01:16
18	you have extensive medical-sensing technology	01:16
19	experience?	01:16
20	MR. HANSEN: Excuse me. What --	01:16
21	where are we at?	01:16
22	MR. MASON: This is paragraph 15 of	01:16
23	page 6.	01:16
24	THE WITNESS: Page 6, Section 3.	01:16
25	MR. HANSEN: Yeah, I got it now.	01:16

1 BY MR. MASON:

01:17

2 Q. And I just want to clarify. You
3 have extensive knowledge in the field of
4 medical-sensing technology; is that correct?

01:17

01:17

01:17

5 A. I would say that I have significant
6 experience. The field of medical-sensing
7 technology can be quite broad; but I -- but I
8 do have extensive experience, from our various
9 human subject studies, where we have used both
10 consumer grade, as well as, I guess you could
11 say, medical grade sensors as part of our
12 studies.

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13 Q. And what -- yeah, so what
14 medical-sensing technology have you worked on?

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01:17

15 A. So we have used medical-sensing
16 technology for multiple of our, what I would
17 say, broadly human subject studies where we
18 were studying both students, as well as
19 information workers, and what we would call
20 longitudinal or long-running context where we
21 had used a blend of both consumer grade -- as I
22 talked about, those were primarily what we gave
23 the end users -- as well as medical grade
24 sensing, where we would have tried to validate
25 relevant portions of our consumer grade

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1 technology for the purposes of validating those 01:18
2 studies against usually what would be -- we 01:18
3 would usually use those, what we would kind of 01:18
4 call the ground truths or the golden standard 01:18
5 to then benchmark the extent to which 01:18
6 consumer-facing technology often has 01:18
7 trade-offs, as we talked about earlier, with 01:18
8 embedded systems to allow them to be in the 01:18
9 hands of the consumers, be robust enough to not 01:18
10 break, and come in at an appropriate cost point 01:18
11 that might be still palatable to a user. 01:18

12 Q. And what medical-sensing 01:19
13 technologies did this involve? 01:19

14 A. So thinking back, we had used fairly 01:19
15 extensively heart-rate sensing. I believe one 01:19
16 of the technologies -- I don't remember the 01:19
17 exact name of the company, but they had been 01:19
18 acquired by Medtronic, where we had used 01:19
19 various clinical-grade chest straps. 01:19

20 We had done a fair amount of work in 01:19
21 collaboration -- one of my post docs -- on 01:19
22 using a PSG, polysomnography. And I'm probably 01:19
23 butchering those terms a little bit. But we 01:19
24 had used those for the purposes of sleep 01:19
25 studies, trying to look at -- in particular, 01:19

1 when you have a wearable, we're trying to 01:19
2 validate things like light sleep, REM sleep, 01:19
3 deep sleep, and looking at the accuracy of some 01:20
4 of the wrist-worn wearables and other 01:20
5 technology you might use to -- to study the 01:20
6 extent that they would be accurate when we were 01:20
7 doing longitudinal studies. Looking at people 01:20
8 over a whole year, could we trust the data and 01:20
9 how it mapped? 01:20

10 We had also looked at using, again, 01:20
11 chest straps for the purposes of stress. That 01:20
12 uses, typically, things like heart-rate 01:20
13 variability. 01:20

14 And then we'd also looked at, I'd 01:20
15 like to say, galvanic skin response, GSR, 01:20
16 looking at that as well for the purposes of 01:20
17 stress. 01:20

18 Q. And what devices were measuring this 01:20
19 GSR? 01:20

20 A. We had looked at -- in that case, it 01:20
21 would have been primarily consumer-grade 01:20
22 wearables; where some of them had used it -- 01:20
23 the field kind of moved away from GSR. In some 01:20
24 sense, as you kind of got lower on the wrist, 01:21
25 it would tend to be -- as you moved from, say, 01:21

1 like your bicep down to your arm, it would get 01:21
2 harder to pick up GSR accurately. It also can 01:21
3 be kind of power intense to do that. 01:21

4 We'd also explored the use of -- 01:21
5 there's a company out of Massachusetts called, 01:21
6 I believe, they have Affectiva or Empatica. We 01:21
7 had looked at their devices, which were, I 01:21
8 believe, clinically approved for some of the 01:21
9 sensing, but a bit too expensive. As many of 01:21
10 our studies, we went with hundreds of 01:21
11 individuals. And so spending several thousand 01:21
12 dollars on each wearable would have been too 01:21
13 much. And so we'd looked at how can we map 01:21
14 some of the lessons we learned from some of 01:21
15 those devices and would they manifest 01:21
16 themselves appropriately in those 01:21
17 consumer-grade devices. 01:21

18 Q. So other than heart-rate sensing, 01:21
19 GSR sensing, and sleep-related sensing, were 01:22
20 there any other medical-sensing technologies 01:22
21 that you worked on? 01:22

22 A. We've also looked at various 01:22
23 menstrual sensing. One of my students has a 01:22
24 keen interest in that, so we'd looked at some 01:22
25 of that. There is also -- some of our 01:22

1 collaborators at Notre Dame have kind of, I 01:22
2 guess you could say, kind of more out-there 01:22
3 sensors. So kind of trying to find different 01:22
4 applications and what we can do. They -- they 01:22
5 tend to have a lot more channels of information 01:22
6 that they kind of know what to do with. 01:22

7 We'd also -- we paid fairly close 01:22
8 attention to different advances. So we've been 01:22
9 interested in particular cortisol. Cortisol is 01:22
10 highly related to sleep. We've done studies on 01:23
11 like snoozing. And so we've been interested in 01:23
12 could you actually sense cortisol and also, of 01:23
13 course, glucose. It would be great if you 01:23
14 could sense it with -- with doing sort of a 01:23
15 noncontact, if you will, sensing. 01:23

16 So we -- we tend to pay attention to 01:23
17 advances in that space. But oftentimes, the 01:23
18 type of studies that we run, they're just not 01:23
19 practical for us to deploy with kind of the -- 01:23
20 the size of the study that we'd like to run, 01:23
21 the budget that we have. We rarely can use 01:23
22 some of those. 01:23

23 But we do follow advances in those 01:23
24 areas in case those options might be available. 01:23
25 Because they could be potentially impactful if 01:23

1 we could bring in new channels of sensing for 01:23
2 our kind of a multimodal time series data, 01:23
3 particularly very complicated data streams 01:23
4 where we're trying to make sense of what we 01:23
5 would say is kind of broader aspects of the 01:24
6 human condition, things like stress, sleep, 01:24
7 general perception, things like conflict 01:24
8 resolution, things that get more into kind of 01:24
9 your mental state and kind of people's 01:24
10 perception. 01:24

11 Those signals are often very noisy 01:24
12 and very complicated. And so we're always 01:24
13 interested in what data streams we could bring 01:24
14 in to -- that we could augment that with. 01:24

15 Q. And then so just to be clear, have 01:24
16 you ever worked on glucose-sensing technology? 01:24

17 A. I have not personally built a 01:24
18 glucose sensor or necessarily deployed one 01:24
19 myself. 01:24

20 Q. Yeah. And maybe my question wasn't 01:24
21 phrased properly. 01:24

22 But have you ever worked on embedded 01:24
23 systems that interfaced with glucose sensing 01:24
24 technology? 01:24

25 A. I have not personally written code 01:24

1 or -- or had my students do work that's 01:24
2 interfaced with glucose technology per se as 01:24
3 part of our research efforts. 01:25

4 Q. Okay. And have you ever worked on 01:25
5 embedded systems that interfaced with 01:25
6 implantable medical devices? 01:25

7 A. That's a good question. I don't 01:25
8 think we've looked at -- and I say "we," as in 01:25
9 my research lab, has looked at implantable. 01:25
10 Because often the scrutiny that you get from an 01:25
11 IRB, or what's known as an institutional review 01:25
12 board, becomes considerably higher. 01:25

13 We tend to usually -- and again, I 01:25
14 say "we," as in I -- tend to focus more on 01:25
15 standoff sensing or -- to the extent that we 01:25
16 can kind of minimize what we have to have on a 01:25
17 person usually tends to lend itself better to 01:25
18 longer-term studies. 01:25

19 Q. You used the term "standoff 01:25
20 sensing." Is that correct? 01:26

21 A. Yes, I did. 01:26

22 Q. What do you mean by standoff 01:26
23 sensing? 01:26

24 A. So by standoff sensing -- and this 01:26
25 is getting a little bit far afield of the 01:26

1 report, but what are sensors that you can have 01:26
2 that might be mounted in a room or mounted 01:26
3 nearby that are not necessarily on the person. 01:26
4 Those often lend themselves to the capacity to 01:26
5 have additional power, potentially being 01:26
6 plugged into the wall. And so oftentimes, 01:26
7 there's less tradeoffs in those kind of 01:26
8 devices, allowing us to do more sophisticated 01:26
9 things. 01:26

10 Q. Okay. And all I'm trying to do is 01:26
11 get a sense of the medical-sensing technology 01:26
12 that you're referring to here in paragraph 15. 01:26

13 Yeah, so -- I mean, is it fair to 01:26
14 say that it focuses -- strike that. 01:26

15 Is it fair to say this 01:26
16 medical-sensing technology that you describe in 01:26
17 paragraph 14 focuses on standoff sensing? 01:27

18 A. I wouldn't say that's -- that's not 01:27
19 how I would characterize it. So this was in 01:27
20 paragraph 15. It would -- we like standoff 01:27
21 sensing when we can use it, but there are many 01:27
22 tradeoffs that come in. And so we end off -- 01:27
23 end up often still having to do on-person 01:27
24 sensing just because you -- you can't sense 01:27
25 some things reliably from a standoff 01:27

1 perspective. They're nice to have, but there
2 is often deployment and other issues that come
3 with it.

4 So I have a blend of experience of
5 both standoff sensing, as well as on-person
6 sensing as part of my core research efforts
7 that I do.

8 Q. Okay. Did any of the
9 medical-sensing technology you worked on
10 provide information to users via a display?

11 A. There are -- looking at some of the
12 medical-sensing technology that I've done, some
13 of them do have a display. Some of them, if we
14 look at things like, say, like a Garmin
15 vivosmart, V-I-V-O, smart, as well as like a
16 Fitbit-type of device, often have a -- usually
17 a very rudimentary display with a -- with a
18 minimal number of pixels, but oftentimes
19 reasonably sophisticated but still somewhat
20 restricted in terms of the real estate that
21 they might have.

22 Q. Okay. And in your work, these
23 systems -- the data that you're creating or
24 analyzing is output to these user device
25 displays; is that correct?

1 A. I'm not sure I would characterize it 01:29
2 that way. Oftentimes, a wearable in those 01:29
3 contexts gather more information than what 01:29
4 would be displayed. And typically, as part of 01:29
5 our research studies, we would be interested in 01:29
6 not only what might be displayed to the user, 01:29
7 but also some of the more, I guess you could 01:29
8 say, raw or lower level signals which may or 01:29
9 may not be actually shared with the user. 01:29

10 Q. Okay. And so just so I understand, 01:29
11 this medical-sensing technology that you 01:29
12 describe in paragraph 15, in some instances, 01:29
13 does involve outputting data to user devices 01:29
14 such as a Fitbit? 01:29

15 A. That would be one example of a 01:29
16 particular device oriented at that. We've also 01:30
17 used other devices which have no display. 01:30

18 Q. And the work that you're doing is 01:30
19 creating the systems that provide data that's 01:30
20 output to that display; is that correct? 01:30

21 A. I'm not sure I would characterize it 01:30
22 that way. We have used -- often, in those 01:30
23 studies, we've used those devices. They're 01:30
24 consuming facing, if you will. So we end up 01:30
25 using their systems to then retrieve the data 01:30

1 ourselves. Or we might fetch it via the Web or 01:30
2 other mechanisms from their cloud, sometimes 01:30
3 locally from the device itself where we might 01:30
4 fetch that information. 01:30

5 In other cases, there is no display; 01:30
6 and we just simply plug it into like a dongle. 01:30
7 And then we would use either things like USB or 01:30
8 Bluetooth to download the data -- the data. It 01:30
9 would usually depend upon the device itself. 01:31

10 Q. Yeah, okay. There may be a better 01:31
11 way to ask this. I'm just trying to get a 01:31
12 sense if you've worked on developing systems 01:31
13 that actually -- you know, that those systems 01:31
14 themselves output the data that you're 01:31
15 collecting and analyzing to the user device. 01:31

16 So with that being said, you know -- 01:31

17 A. Yeah. 01:31

18 Q. -- do any of the devices that you've 01:31
19 worked on collect data and then output that 01:31
20 data to a user device? 01:31

21 A. Certainly some of the devices that 01:31
22 I've worked on would gather data locally, sense 01:31
23 it locally, and then display some of that data 01:31
24 to the user. 01:31

25 Q. So you've -- you've designed and 01:31

1 implemented devices that gather data and then 01:31
2 provide that data to the user? 01:31

3 A. I have looked at designing systems 01:31
4 that do gather data and provide data to the 01:31
5 user in a broad sense. 01:31

6 Q. Okay. And do they provide data to 01:31
7 the user in real time? 01:31

8 A. Sometimes they do on that. In terms 01:31
9 of the system, it would depend upon what the 01:32
10 particular application might be and if it would 01:32
11 make sense to display that data in real time or 01:32
12 if it might require processing that might not 01:32
13 be possible on that device. 01:32

14 It may be primarily just an 01:32
15 instrumentation approach where we might log the 01:32
16 data and then need more sophisticated 01:32
17 processing on the back end. And so there may 01:32
18 be even where it might send the data, have it 01:32
19 processed, and then it might come back. And 01:32
20 then depending upon the system itself, it -- 01:32
21 depending upon what you're trying to do, 01:32
22 sometimes there can be multiple components 01:32
23 where you might need to transmit process and 01:32
24 maybe reflect it back. 01:32

25 For our studies, often we're 01:32

1 interested in the instrumentation part much 01:32
2 more than the display part. Because often 01:32
3 we're doing long-running studies and are -- are 01:33
4 less concerned with what the user needs to see 01:33
5 at that time as opposed to cleanly 01:33
6 instrumenting the data. 01:33

7 Q. Okay. And does the medical-sensing 01:33
8 technology described in paragraph 15, does any 01:33
9 of that technology involve providing real-time 01:33
10 data to users with the idea that users will -- 01:33
11 will make decisions in real time based on that 01:33
12 data? 01:33

13 A. Thinking about some of that sensing 01:33
14 technology, a user could make decisions. 01:33
15 Although given the scope of some of the 01:33
16 devices, the types of decisions they might make 01:33
17 would be much more limited. Because often, 01:33
18 these devices are not doing things like, say, 01:33
19 like a glucose where, you know, you might need 01:33
20 to make a more real-time-ish kind of a decision 01:34
21 versus, say, did I sleep well the night before 01:34
22 or how many steps do I have. Those kind of 01:34
23 different time scales. 01:34

24 Q. Okay. Can I have you turn to 01:34
25 paragraph 42 of your report? Strike that. 01:34

1 Can I have you turn to paragraph 42 01:34
2 of your declaration? 01:34

3 A. Understood, counsel. 01:34

4 Q. I'm maybe being too dogmatic, but 01:34
5 best to be clear on the record. 01:34

6 Okay. So -- strike that. 01:34

7 In paragraph 42, you use the term 01:34
8 "display buffer," correct? 01:34

9 A. I do see that, in the middle of the 01:35
10 paragraph, I use the term display buffer in 01:35
11 quotes. 01:35

12 Q. And you use that term display buffer 01:35
13 here in paragraph 42 to refer to volatile 01:35
14 memory that stores data to be displayed on a 01:35
15 screen; is that correct? 01:35

16 A. So in here, I -- I say that what a 01:35
17 POSA reading, in particular, Exhibit 1011 would 01:35
18 understand that data for displaying trend 01:35
19 graphs of 3-hour and 24-hour periods on a 01:35
20 screen would likely be kept in volatile memory, 01:35
21 e.g., a static random access memory, SRAM, for 01:35
22 quick retrieval. 01:35

23 (Reporter clarification.)

24 THE WITNESS: Sorry -- e.g., a
25 static random access memory, SRAM, S-R-A-M, 01:35

1 for quick retrieval ("display buffer"). 01:35

2 BY MR. MASON:

3 Q. Okay. And is this -- strike that. 01:36

4 And this is in the context of a 01:36

5 hypothetical system that you proposed in your 01:36

6 declaration, correct? 01:36

7 A. What do you mean by the term -- what 01:36

8 do you mean by hypothetical system? 01:36

9 Q. Well, are you -- are you -- in 01:36

10 paragraph 42, are you describing an actual 01:36

11 system that was implemented by somebody? 01:36

12 A. Well, in paragraph 42, as I had 01:36

13 described and have a footnote earlier, I 01:36

14 believe Exhibit 1011 is referring to the 01:36

15 Paradigm system. And so in this case, I'm 01:36

16 basing my opinion on what I have seen as 01:36

17 provided. And I cite, in this case, Exhibit 01:36

18 1011, as well as Exhibits 2018 and 2007, as 01:36

19 being the information about the Paradigm 01:37

20 product. 01:37

21 So I'm interpreting, I'd say, not 01:37

22 as -- would not be necessarily a hypothetical 01:37

23 system, but using my expert knowledge to 01:37

24 evaluate the Paradigm system based on the 01:37

25 information that's provided as part of the 01:37

1 case. 01:37

2 Q. Okay. Do the documents that you 01:37
3 reference here on page 22 describe a display 01:37
4 buffer? 01:37

5 A. I don't recall if they use the term 01:37
6 display buffer. In this case, as I described 01:37
7 in my paragraph, I'm talking about what would 01:37
8 likely be kept in RAM, that part that -- that 01:37
9 component of memory, and that a -- how you 01:37
10 would actually put it on the display is that 01:38
11 would likely be kept in that volatile memory 01:38
12 itself. 01:38

13 Q. Okay. And is this SRAM display 01:38
14 buffer that you're describing here what -- what 01:38
15 is accessed by a display controller or a 01:38
16 display driver? Is that what you're 01:38
17 describing? 01:38

18 A. So those -- those terms have very 01:38
19 specific meanings. So could you be a bit more 01:38
20 specific? 01:38

21 Q. Yeah. I guess what does this SRAM 01:38
22 display buffer -- or strike that. 01:38

23 You define a display buffer in 01:38
24 paragraph 42, correct? 01:38

25 A. I see that I use the term display 01:38

1 buffer. I don't know if I would say that I 01:39
2 necessarily define the term display buffer, but 01:39
3 I would -- based on my knowledge of what a 01:39
4 display buffer is doing and what I feel a POSA 01:39
5 would know, it's a -- it's a reasonable term. 01:39

6 Q. Well, yeah, no. And all I'm trying 01:39
7 to understand is what you meant by putting 01:39
8 display buffer within quotes within a 01:39
9 parenthetical. Were you intending to define 01:39
10 that term as everything in the preceding, you 01:39
11 know, aspect of the sentence? Or as you just 01:39
12 stated, were you referring to some known term 01:39
13 in the art for display buffer? 01:39

14 A. I don't recall. I do know that when 01:39
15 I write, I like to use parentheses. So I 01:39
16 don't -- I couldn't say specifically why I put 01:39
17 it in parentheses, outside that I do like to 01:39
18 use parentheses when I write -- 01:39

19 Q. Mm-hmm.

20 A. -- my text. So I don't know if it 01:39
21 served a particular exact role outside of 01:39
22 referencing, in this case, why the volatile 01:40
23 memory would be used in that particular role. 01:40

24 Q. To maybe help me better understand, 01:40
25 when do you typically use parentheses in your 01:40

1 writing? 01:40

2 A. I like to use them. Often it helps 01:40
3 me keep my thoughts straight. I don't know if 01:40
4 I have a particular rhyme or reason. I just 01:40
5 know that over the years I tend to use them 01:40
6 sometimes, perhaps a bit too much. 01:40

7 So I don't know. I couldn't say I 01:40
8 could point to a specific strategy of when I 01:40
9 use parentheses, but I -- I do like to use them 01:40
10 here and there. 01:40

11 Q. And sitting here today, you can't 01:40
12 recall what you intended to convey by putting 01:40
13 display buffer within parentheses; is that 01:40
14 correct? 01:41

15 A. I think as I -- as I read this, on 01:41
16 it -- I'm talking about here on a screen would 01:41
17 likely be kept in volatile memory, e.g., a 01:41
18 static random access memory for quick 01:41
19 retrieval. And that being basically saying, 01:41
20 look, this is a display buffer. If I want to 01:41
21 have it be reasonable in terms of time to 01:41
22 access from an embedded system design 01:41
23 perspective, it would make sense to have it in 01:41
24 the memory. 01:41

25 Later in the report, I talk a little 01:41

1 bit about latency in paragraph 44, where I 01:41
2 explain a little bit about the notion of 01:41
3 responsiveness and getting into the fact that 01:41
4 because when I have a display and a user is 01:41
5 pressing buttons, I would like it to be 01:41
6 reasonably responsive. 01:41

7 To the extent that I can on devices 01:42
8 in that time frame, they're always going to 01:42
9 feel a little slow. But to the extent I can 01:42
10 have it be as quick as I can, as a designer, 01:42
11 having that as a kind of a buffer, if you will, 01:42
12 of where I put it, I would like to avoid the 01:42
13 cost of going to like a longer term or a slower 01:42
14 storage. 01:42

15 So by putting it in the volatile 01:42
16 memory, that's kind of as quick as it can be, 01:42
17 if you will, so that the device could seem as 01:42
18 responsive as it could be. 01:42

19 Q. Yeah. And maybe coming back to one 01:42
20 of your earlier answers, did you say display 01:42
21 buffer has a known meaning in the art? 01:42

22 A. In the sense of oftentimes for a 01:42
23 display, I will want to buffer or have a part 01:42
24 of memory where I might -- sometimes on some 01:42
25 systems, you might share it. So the display 01:42

1 would have -- or display adapter might have a 01:43
2 direct interface to that particular buffer. 01:43

3 Sometimes on different systems, you 01:43
4 have dedicated memory between them. Sometimes 01:43
5 it's shared memory. There is a lot of 01:43
6 different ways that you could go about doing 01:43
7 it. But basically, the notion of space and 01:43
8 memory that I would be using to house 01:43
9 information that I'm going to display. 01:43

10 But getting back to our earlier 01:43
11 conversation on displays, there is many 01:43
12 different displays and many different ways that 01:43
13 you can do displays on an embedded system. 01:43

14 Q. Okay. Is this display buffer that 01:43
15 you're describing in paragraph 42 used 01:43
16 exclusively for display information associated 01:43
17 with trend graphs? 01:43

18 A. Not necessarily. Something like a 01:44
19 trend graph, depending upon the sophistication 01:44
20 of the particular display unit, could have 01:44
21 different ways. Given that a trend graph would 01:44
22 have a line graph component to it, the pixels 01:44
23 and how you would draw it might be a bit more 01:44
24 involved, depending upon the particular display 01:44
25 controller and how you might map out where the 01:44

1 lines be, the particular X/Y coordinates, and 01:44
2 how it might operate on it. 01:44

3 So it's -- that would be a place. 01:44

4 But it also could be used for other things as 01:44

5 well, given that the display would interact 01:44

6 with the user for a variety of roles, which I 01:44

7 talk about also in different parts of my report 01:44

8 as well. 01:44

9 Q. Does this display buffer hold just 01:44
10 pixel information? 01:45

11 A. So in this case, I'm talking about 01:45
12 the notion of -- in my volatile memory, I would 01:45
13 like to put in there information about what I 01:45
14 might want to have on the screen. 01:45

15 Again, depending upon how it might 01:45
16 be connected, there is a variety of ways to do 01:45
17 that. It could be just pixels that I want to 01:45
18 put on the screen. It could be -- also, it 01:45
19 might be where I might put strings on the 01:45
20 screen. If I think of the display as sort of 01:45
21 a -- thinking about the paradigms on it with 01:45
22 its limited display, if I think about it as 01:45
23 sort of a very crude GUI, or graphical user 01:45
24 interface, depending upon what the display 01:45
25 does, I might have different options of what I 01:46

1 need to -- to send to the actual display unit 01:46
2 itself. 01:46

3 Could I just send a string? Do I 01:46
4 have to map out, say, the letter "S" in pixels? 01:46
5 Or can I -- can I just point and say, okay, I 01:46
6 want the letter "S" here? That will depend 01:46
7 upon the particular hardware that's involved 01:46
8 and any -- any sort of intermediate components 01:46
9 as well. 01:46

10 Q. And what do you mean by "string" in 01:46
11 that last answer? 01:46

12 A. So when we go to put things on, say, 01:46
13 a display, going back even to the earlier 01:46
14 discussion, sometimes when we refer to a string 01:46
15 from a -- whether it's an embedded system or a 01:46
16 programming perspective, we would call a string 01:46
17 as being a set of characters that you and I can 01:46
18 see. 01:46

19 So for instance, my last name 01:46
20 Striegel, S-T-R-I-E-G-E-L, when I interact with 01:47
21 the display, I might just be able to send -- 01:47
22 put Striegel here on the display or put it on 01:47
23 row zero. 01:47

24 The other way is, I might need to 01:47
25 say, well, I need to make an "S." And so I 01:47

1 need to put a pixel here and a pixel here and a
2 pixel here and kind of light it up. So on a
3 line graph where you might have -- or a trend
4 graph where you have varying sorts of things,
5 I'm probably going to have to map out those
6 pixels. Maybe.

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7 Again, some different controllers
8 might have different options versus the display
9 and display controller that comes with it may
10 support the ability where I can simply put a
11 string at a location and make my life as a
12 programmer much easier, saying put this string
13 with maybe this font or the default font at
14 this location.

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15 Q. Okay. So you -- in using the term
16 string, you're just referring to text or -- or
17 characters?

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18 A. Generally speaking, we would think
19 of a string as being usually human-readable
20 characters, if we think about most systems.

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21 There can be binary strings, but
22 we'll -- we'll just stay kind of on the --
23 usually a string refers to something that
24 humans can read or at least perceive.

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25 Q. And that is -- strike that.

01:48

1 And are strings different than from 01:48
2 graphical information? 01:48

3 A. If I'm understanding your question 01:48
4 correctly, if we think about -- in some sense, 01:48
5 when you represent a string on a screen, it's 01:48
6 intrinsically graphical information. Because 01:48
7 you eventually have to figure out where you put 01:48
8 the pixels to say it represents the string. 01:48

9 But it may not be your job, as the 01:48
10 programmer, to figure it out. You may simply 01:49
11 just have to say, through a library, I would 01:49
12 like an "S" here. 01:49

13 Something that has maybe more 01:49
14 sophisticated information, maybe like a graph, 01:49
15 if you will, or trend data, as I talk about in 01:49
16 my report, oftentimes it has to be done on 01:49
17 pixel-by-pixel bases to figure out how to 01:49
18 render, say, something that has more 01:49
19 complicated information when I don't have a lot 01:49
20 of real estate. 01:49

21 So in a -- in a perfect system, like 01:49
22 most days we're used to now, on a smartphone, 01:49
23 we have more pixels almost than we know what to 01:49
24 do with and we can present things however we 01:49
25 would like. But say in a display and say like 01:49

1 in this case, like the Paradigm system, we have 01:49
2 a very limited real estate and a very limited 01:49
3 number of pixels that you can turn on and off. 01:49
4 And so figuring out how to kind of draw that or 01:49
5 render it can be potentially challenging, but 01:49
6 often it can create limitations on what you 01:50
7 might be able to see or perceive of the utility 01:50
8 of it in terms of really fine-grained 01:50
9 information. 01:50

10 Q. And so the display buffer that you 01:50
11 describe in paragraph 42, does that contain 01:50
12 only trend graph pixel information? 01:50

13 A. So the display buffer could contain 01:50
14 trend graph information. It could contain 01:50
15 other information as well. 01:50

16 So we can think of if I take memory 01:50
17 on a -- on a given system -- in this case, the 01:50
18 parts of the volatile memory -- and use it as a 01:50
19 display buffer, one use could be for the trend 01:50
20 graph. Another use could be for different 01:50
21 elements, as we talked about with a GUI, or 01:50
22 GUI, that we might have where we might have 01:51
23 like what looks like a button that contains 01:51
24 okay or cancel or like a scroll bar. 01:51

25 We can think of that display buffer 01:51

1 as being a proxy for I kind of draw my screen, 01:51
2 if you will, on the display buffer; and then 01:51
3 that gets mirrored as part of my actual 01:51
4 physical output that might show up. But again, 01:51
5 depending upon the underlying system on how 01:51
6 they're actually arranged to do that. 01:51

7 But oftentimes, we view it as kind 01:51
8 of a -- we kind of draw it and then send it 01:51
9 over, if you will, in terms of when we refresh 01:51
10 the screen. But that's one fairly common way 01:51
11 that one might do that. But again, it's going 01:51
12 to depend upon the type of system and the power 01:51
13 draw involved and what the right approach might 01:51
14 be and how much it might change and how a user 01:52
15 might interact with it. 01:52

16 Especially as we get into really low 01:52
17 power devices, we might need to take more 01:52
18 drastic steps to help us meet the power 01:52
19 constraints. So say like in a Paradigm system 01:52
20 which has like one AAA battery, we have to be 01:52
21 very mindful that we don't do kind of 01:52
22 unnecessary stuff. Because again, we have only 01:52
23 a single AAA battery, not a -- as we talked 01:52
24 about earlier with standoff sensing, we're not 01:52
25 plugged into the wall. We're portable, and 01:52

1 we're limited. We have to be very cognizant in 01:52
2 our system design of how we might -- how and 01:52
3 when we might do those things. 01:52

4 Q. And so if I understand -- understood 01:52
5 your answer correctly, this display buffer 01:52
6 would also contain the display data, for 01:53
7 example, in paragraphs -- for the display shown 01:53
8 in paragraphs 36 to 38 of your declaration; is 01:53
9 that correct? 01:53

10 A. So I don't -- I don't know if I 01:53
11 would -- I would just be careful on the use of 01:53
12 the word "also." So we could think of a 01:53
13 display buffer as being, I don't know, if we 01:53
14 think of it as like a scratch pad or a place 01:53
15 where I can put things for whatever purpose 01:53
16 that I might be using the display for. 01:53

17 So I would be careful to say also; 01:53
18 because often, the amount of memory that you 01:53
19 have on a system like this, which is highly 01:53
20 constrained, is very limited. And so we often 01:53
21 end up using it for different purposes, 01:53
22 depending upon what the user is doing with the 01:53
23 system at the time. 01:53

24 Q. So -- but when you say that -- are 01:53
25 you just trying to make the point that -- by 01:53

1 also that -- strike that. 01:54

2 Is your point that, for example, at 01:54
3 any given time, that display buffer, you know, 01:54
4 might contain the information needed to display 01:54
5 the screen that you show in paragraph 36; but 01:54
6 it would not also include the information 01:54
7 needed to display a trend graph? 01:54

8 A. So the -- 01:54

9 Q. I'm just trying to understand -- 01:54

10 A. Yeah, just to -- and again -- 01:54

11 Q. -- what do you mean by also? 01:54

12 A. If I'm kind of following your 01:54
13 information there, the display buffer, we -- we 01:54
14 like that in SRAM or the kind of our fast 01:54
15 memory, if you will, our volatile memory. 01:54
16 Because it will be responsive if we happen to 01:54
17 be showing a -- a trend graph at the time. 01:54

18 That particular portion of the SRAM 01:54
19 could also be used if we -- if we say it's a 01:54
20 display buffer for showing maybe the summary 01:55
21 data which I talk about earlier. 01:55

22 The broader SRAM itself, which is 01:55
23 also still very limited, can also contain other 01:55
24 things. Because it's going to contain, 01:55
25 perhaps, what I'm showing to the screen, but 01:55

1 also information that I need because that's 01:55
2 containing my variables and everything that 01:55
3 I'm -- kind of part of my running code, if you 01:55
4 will, as well as the code itself, if we think 01:55
5 about a typical system, where that volatile 01:55
6 memory kind of contains what I need at the 01:55
7 moment or things that I might need soon, that 01:55
8 I -- that I would have present and would be 01:55
9 running typically accessible to speed of the 01:55
10 system clock. Because again, it would be very 01:55
11 fast because I would most likely need it -- or 01:55
12 I could need it. 01:55

13 And so we can think of our SRAM or 01:55
14 our memory as doing multiple things, one of 01:55
15 which might be that display buffer parts of it. 01:56

16 Q. Yeah. And with respect to that 01:56
17 display buffer, does it -- strike that. 01:56

18 With respect to the display buffer, 01:56
19 is the display buffer used to store both trend 01:56
20 graph display data and sensor display 01:56
21 information, for example, as shown in 01:56
22 paragraphs 36, 37, and 38 of your declaration? 01:56

23 A. So I think -- I think there is a 01:56
24 little bit to kind of unpack there in terms of 01:56
25 how the -- how a typical system would work. 01:56

1 We can think of the display buffer 01:56
2 as playing a role of what am I going to 01:56
3 immediately show on the screen. 01:56

4 Q. Oh, that's the scratch pad that you 01:56
5 were talking about? 01:56

6 A. So it's the scratch pad that we kind 01:56
7 of -- we kind of had very, I would say, 01:56
8 informal, perhaps not perfectly precise, 01:56
9 definition of a scratch pad of what I'm going 01:57
10 to put on the screen. 01:57

11 There is additional data that the 01:57
12 SRAM itself would also hold, which might be 01:57
13 some of that data may be gathered as -- is 01:57
14 computed as part of a summary, immediate data 01:57
15 that I've gathered. And then what -- whatever 01:57
16 the programmer would have decided that should 01:57
17 be housed in memory, subject to the limits of 01:57
18 the system and how much available RAM that I 01:57
19 might have. 01:57

20 It would be highly dependent upon a 01:57
21 particular microcontroller you might use and, 01:57
22 again, kind of what the -- what the system 01:57
23 designer might have -- what choices they might 01:57
24 make on how to use what would be a -- a fairly 01:57
25 scarce resource that would be responsive, but 01:57

1 also scarce. So you would -- you would have to 01:57
2 very intelligently manage how you might use it. 01:57

3 Q. And is one of the points you were 01:58
4 just making is that the SRAM is used for things 01:58
5 other than the display buffer? 01:58

6 A. So the SRAM most likely would be 01:58
7 used for things beyond the display buffer. And 01:58
8 it's also important to remember the broader 01:58
9 context, in that the SRAM in a system is not 01:58
10 the only memory or storage that you might have 01:58
11 as well. 01:58

12 Q. Yeah. And so for these questions, 01:58
13 I'm really just focused on the display buffer. 01:58
14 So can -- can we agree to just focus on the 01:58
15 display buffer as you sort of explained it in 01:58
16 paragraph 42? 01:58

17 A. Sure. We can -- 01:58

18 MR. HANSEN: All right. I object. 01:58
19 That's not a question. It's an 01:58
20 instruction. 01:58

21 MR. MASON: He can disagree with me 01:58
22 if he wants. 01:58

23 MR. HANSEN: We'll -- we'll take 01:58
24 each question as it comes. 01:58

25 Dr. Striegel, you're not required in 01:58

1 advance to agree that you're going to limit 01:58
2 your answer to a particular scope. Answer 01:59
3 the questions as you see fit, as you feel 01:59
4 is necessary to give an accurate answer. 01:59

5 BY MR. MASON: 01:59

6 Q. So with respect to the display 01:59
7 buffer portion of the SRAM, does that display 01:59
8 buffer store both trend graph display data and 01:59
9 display data for other things shown on this 01:59
10 screen, such as the displays that you provide 01:59
11 in paragraphs 36 through 38 of your 01:59
12 declaration? 01:59

13 A. So I think I answered that already. 01:59
14 And if I'm not understanding you, counsel, feel 01:59
15 free to let me know. 01:59

16 Q. Perhaps we can use your scratch pad 02:00
17 analogy. With respect to your scratch pad 02:00
18 analogy -- and I understand that's a crude 02:00
19 analogy, in your own terms -- but did you mean 02:00
20 to say that if you're showing a trend graph to 02:00
21 the user, then the display buffer would contain 02:00
22 some kind of data or information associated 02:00
23 with that trend graph? 02:00

24 A. Kind of keeping with that scratch 02:00
25 pad analogy -- and I always get in a little bit 02:00

1 of trouble with analogies, -- we think about a 02:00
2 display buffer, that's often what I want to 02:00
3 render to the screen. 02:00

4 So as I described earlier, if we 02:00
5 take a look at, say, the Paradigms, which has 02:00
6 significant limit in terms of pixel count and 02:00
7 pixel size, I guess one could argue somewhat 02:00
8 that it contains a representation of data. But 02:00
9 given that if we -- if we think about the 02:00
10 number of pixels that are present and the 02:01
11 actual data as observed that would be present, 02:01
12 there is a healthy compression, if you will, of 02:01
13 that data because of the limited screen real 02:01
14 estate, which -- what would -- typically when 02:01
15 you have a display buffer, I'm trying to mark 02:01
16 which pixels. 02:01

17 And if I look at, say, something 02:01
18 like the Paradigms, which has an LCD display, 02:01
19 I'm trying to demarcate -- because it's not 02:01
20 color, I'm trying to demarcate which pixels 02:01
21 would be on or off. So it's more of a 02:01
22 representation of, for the screen that I want 02:01
23 to show, which pixels should be lit up. 02:01

24 So it's a graphical interface for 02:01
25 the user; but in terms of being the actual data 02:01

1 itself, you -- you would have a tough time, 02:01
2 because you've compressed it down to fit, of 02:01
3 figuring out what the original data is. So 02:02
4 it's more of like here is what I'm actually 02:02
5 going to show on the screen as opposed to 02:02
6 the -- the actual data itself. 02:02

7 Q. And do you understand the Paradigm 02:02
8 system to operate in a way where a user can 02:02
9 switch from a trend graph display to a menu 02:02
10 display? 02:02

11 A. I do understand that. And looking 02:02
12 at just the buttons that are present on the 02:02
13 Paradigm system and the documentation that I 02:02
14 considered, that you can -- by pressing your 02:02
15 various buttons, you could navigate various 02:02
16 menus or choose what you would like to have 02:02
17 displayed. 02:02

18 Q. And if a user reviewing a trend 02:02
19 graph, would the display buffer contain 02:02
20 information associated with that trend graph? 02:02

21 A. So I think we want to be careful, as 02:03
22 I just described earlier. You have a very 02:03
23 limited screen real estate. And so this would 02:03
24 be the -- the representation of what I can fit 02:03
25 in the limited pixel count on the screen. 02:03

1 But in terms of saying it's the same 02:03
2 thing as the trend data, I wouldn't say they're 02:03
3 the same thing. Because this is a -- this is a 02:03
4 display with a limited pixel count. And I have 02:03
5 to just -- particularly in the time, say, 2009, 02:03
6 I have a lot of trade-offs in terms of what I 02:03
7 might want to display versus what I can 02:03
8 actually physically represent under the 02:03
9 constraints that I actually have. 02:03

10 Q. So is your point that the display 02:03
11 buffer contains data sufficient to create the 02:03
12 display on the screen which might not be the 02:03
13 same as the actual underlying data that was 02:03
14 used to create that representation? 02:04

15 A. I think I would characterize it as 02:04
16 saying these are the -- the display buffer 02:04
17 contains the pixels that I want to light up 02:04
18 based on the decisions that I made on how I 02:04
19 might want to manifest whatever I might want to 02:04
20 display. And that's -- that's about as far as 02:04
21 I would go in saying -- describing that. 02:04

22 Q. And then if the user switched from 02:04
23 the trend graph to like, say, the menu display 02:04
24 shown on paragraph 38 of your declaration, 02:04
25 would the display buffer then be updated with 02:04

1 the pixel information associated with that 02:04
2 image shown in paragraph 38? 02:04

3 A. It certainly could be. So this is 02:05
4 looking at the image at the bottom of page 19, 02:05
5 on paragraph 38. So I believe it -- the first 02:05
6 one is --

7 (Reporter clarification.) 00:43

8 THE WITNESS: 19, sorry.

9 So that the top portion of that 02:05
10 report describes an excerpt from that 02:05
11 exhibit. And then later, there is a 02:05
12 representation of the screen from that 02:05
13 manual of what a user might hypothetically 02:05
14 see. 02:05

15 And we can see elements here where 02:05
16 we see a date, some different information. 02:05
17 And then as we talked about earlier, there 02:05
18 is kind of a crude, one would say, like a 02:05
19 scroll bar showing that there's -- there is 02:05
20 maybe more information that one could move 02:05
21 down to. 02:05

22 And it looks very crude because, 02:05
23 again, there's not a lot of screen real 02:05
24 estate and not as many pixels to -- to put 02:05
25 that on the screen. So it often looks very 02:05

1 kind of clunky or limited. 02:05

2 BY MR. MASON:

3 Q. So coming back to my question then, 02:06

4 if the user switched to that screen which 02:06

5 you've just described and as shown on the 02:06

6 bottom of page 19 of your declaration, would 02:06

7 the display buffer then be populated with the 02:06

8 pixel information associated with that screen 02:06

9 shown on page 19? 02:06

10 A. It certainly could be on that, 02:06

11 depending upon how it might be used. Again, 02:06

12 depending upon the limited -- what resources 02:06

13 you might have on a system, the display buffer 02:06

14 does not always have to be a constant size. 02:06

15 And depending upon the controller or for how 02:06

16 you -- the actual display itself, the size of 02:06

17 the display buffer could potentially grow and 02:06

18 shrink as well, depending upon that. 02:07

19 But it could -- could contain, as we 02:07

20 talked about earlier, things just like strings 02:07

21 of -- I would like to put this string at this 02:07

22 X/Y location. Because here, now, we start to 02:07

23 see text. 02:07

24 And then also, it may be as simple 02:07

25 as here's -- here is where I'm at in the scroll 02:07

1 or progress bar. It would depend upon how the 02:07
2 underlying code might have been implemented to 02:07
3 do that. 02:07

4 Q. So you're saying that this display 02:07
5 that's shown on the bottom of page 19, the 02:07
6 display buffer might not be used to show that 02:07
7 on the screen? 02:07

8 A. It would depend upon how it was 02:07
9 actually implemented underneath. So in this 02:07
10 case, on some systems, sometimes you can have 02:07
11 where you don't have to use the display buffer 02:07
12 because you're not trying to -- I don't need to 02:07
13 control specific pixels. I have particular 02:07
14 API -- API being application program -- 02:08
15 programming interface -- that might allow me to 02:08
16 just put strings at locations without needing 02:08
17 to do, I guess you could say, crudely kind of 02:08
18 pixel art where you're trying to draw something 02:08
19 more sophisticated. 02:08

20 And you might simply be able to say, 02:08
21 put this string at this location, this string 02:08
22 at this location, this string at this location 02:08
23 and avoid having to do a more sophisticated 02:08
24 display buffer in that case. Or you might need 02:08
25 to use the memory again for other things, given 02:08

1 what you're trying to do, perhaps when you 02:08
2 arrive at that summary data. 02:08

3 Because of the limited nature of the 02:08
4 systems, you may need to use it for different 02:08
5 things at different times, depending upon what 02:08
6 the display might offer and what you need to 02:08
7 put in memory to do the things that you want to 02:08
8 show to the user. 02:09

9 Q. Yeah. And all I'm trying to 02:09
10 determine is sort of the scope of -- in your 02:09
11 hypothetical system in paragraph 42, what the 02:09
12 display buffer is used to store, whether it's 02:09
13 limited to trend graphs or also stores other 02:09
14 display information for the system. 02:09

15 A. So I might push back on your usage 02:09
16 of hypothetical system. Because as I describe 02:09
17 in my paragraph, I'm basing my opinion on the 02:09
18 documentation that I've seen for the Paradigm 02:09
19 system. So I'm specifically discussing my 02:09
20 opinion with regards to the Paradigm system and 02:09
21 how it works. 02:09

22 Q. And -- yeah, and we can discuss 02:09
23 that. Yeah, so with respect -- strike that. 02:09

24 Where does the Paradigm 02:09
25 documentation describe displaying -- strike 02:09

1 that. 02:09

2 Where is the Paradigm documentation 02:09
3 that you cite to describe keeping the data for 02:10
4 displaying trend graphs of 3-hour and 24-hour 02:10
5 periods in volatile memory? 02:10

6 A. So as I describe earlier in the 02:10
7 paragraph, I'm drawing on my own experience 02:10
8 designing embedded systems and what information 02:10
9 was provided by DexCom in Exhibit 1011, as well 02:10
10 as the other two exhibits which I cite, which 02:10
11 were additional user manuals. 02:10

12 And so I'm using that and drawing on 02:10
13 my knowledge of design in terms of how I'm 02:10
14 describing how the system would likely work. 02:10

15 Q. Okay. So this is not the actual 02:10
16 system described in those documents. It's sort 02:10
17 of your understanding of how such a system 02:10
18 might be implemented; is that correct? 02:10

19 MR. HANSEN: Objection. Asked and 02:10
20 answered. 02:10

21 THE WITNESS: So I think I've -- 02:10

22 MR. HANSEN: Form. 02:10

23 THE WITNESS: I've answered the 02:10
24 question. 02:10

25 But again, as I understand for my 02:10

1 particular focus is, I look at the 02:11
2 documentation as provided by DexCom on 02:11
3 that, along with other public 02:11
4 documentation, and my own expertise to 02:11
5 arrive at my opinion that I describe in 02:11
6 this paragraph. 02:11

7 BY MR. MASON: 02:11

8 Q. Okay. Does the documentation you 02:11
9 just referred to provide specific hardware 02:11
10 details as you lay them out here in 02:11
11 paragraph 42? 02:11

12 A. So looking at in 42, describing the 02:11
13 difference between an SRAM and some of the 02:11
14 details which I also describe later, I don't 02:11
15 believe the specific documentation is provided 02:11
16 demarcated with regards to SRAM. 02:11

17 So I had to draw on my own expertise 02:11
18 with regards to designing embedded systems and 02:11
19 how they would work to arrive at my conclusion. 02:11

20 Q. And did you look for any documents 02:11
21 that described the hardware details of the 02:11
22 Paradigm system? 02:12

23 A. So in this case, as I described -- 02:12
24 in terms of the exhibits, I had described 02:12
25 here what the -- what was provided by DexCom, 02:12

1 in addition to what I -- what had been found 02:12
2 publicly online. To use that, I used various 02:12
3 aspects of the system capabilities, as 02:12
4 described in the manual, looking at things 02:12
5 like -- as I talk in here, between the trend 02:12
6 graphs. 02:12

7 And then also looking at the 02:12
8 behavior of the CareLink software, the duration 02:12
9 of data that could be summarized, as well as 02:12
10 the duration of data that could be downloaded 02:12
11 by CareLink. I used all of that knowledge 02:12
12 coupled with my knowledge of how you design an 02:12
13 embedded symptom, particularly, let's say, a 02:12
14 low-power system, and the constraints, things 02:12
15 like I had mentioned, the AAA battery. 02:13

16 There are parts about the hardware 02:13
17 that are shared. And I used that then to 02:13
18 arrive at my opinion that I have here. 02:13

19 Q. So is it fair to say that you came 02:13
20 up with a system hardware implementation based 02:13
21 on behavior and functionalities described in 02:13
22 these documents that you referenced? 02:13

23 A. I'm not sure I'm following when you 02:13
24 mention behavior and functionalities. 02:13

25 Q. Well, I think in your answer, you 02:13

1 were talking about the various aspects of the 02:13
2 system capabilities and behavior of the 02:13
3 software. So that's what -- I'm just trying to 02:13
4 get a sense of what you base this on. 02:13

5 And as I understood your answer, and 02:13
6 you should correct me if I'm wrong, is that -- 02:13
7 strike that. I'll just ask the question. 02:13

8 So my question is: Do these 02:13
9 documents you cite to provide any hardware 02:14
10 details? Or did you simply look at the 02:14
11 functionality of those systems and then, based 02:14
12 on your experience, come up with one possible 02:14
13 system for implementing that functionality? 02:14

14 A. So I had -- there were some details 02:14
15 that were provided with regards to the hardware 02:14
16 itself. Information such as the size of the 02:14
17 display, the size of the battery that would be 02:14
18 present, various functionality, if you will, in 02:14
19 terms of how the user might interact. 02:14

20 With that, I drew on my own 02:14
21 expertise and looking at what someone would be 02:14
22 quite likely to do faced with the constraints 02:14
23 that such a system would have to arrive at here 02:14
24 is how a POSA or here is how somebody working 02:14
25 in that space would design the system, given 02:15

1 the wide variety of microcontrollers that would 02:15
2 have been available in 2009 and the technology 02:15
3 to arrive at that. 02:15

4 Some of these aspects, such as the 02:15
5 usage of SRAM, the usage of RAMs and flash 02:15
6 would be incredibly standardized. And it would 02:15
7 be incredibly unlikely to do something 02:15
8 radically different from the well-established 02:15
9 norms that one would have when designing a 02:15
10 system and operating in this space. 02:15

11 So I felt that given the information 02:15
12 that was provided by DexCom and other publicly 02:15
13 information -- other publicly available 02:15
14 information, I feel quite confident in my 02:15
15 analysis here in terms of how the system would 02:15
16 be architected based on what people would be 02:15
17 doing at the time when said -- when the 02:15
18 Paradigm system would have been released. 02:15

19 Q. And is what you describe here in 02:16
20 paragraph 42 the only way a POSA would have 02:16
21 been able to architect the system? 02:16

22 A. As I just described in my prior 02:16
23 answer, there could be other ways that one 02:16
24 could potentially architect a system. They 02:16
25 would be exceedingly unlikely, given if we look 02:16

1 at, say, the volume that one might be having 02:16
2 for said unit, the types of components that 02:16
3 would have been present, and its role kind of 02:16
4 in terms of what would be going on. 02:16

5 But the basic components of having 02:16
6 nominally, say, like your RAM and other 02:16
7 components, such as your ROM and your flash, 02:16
8 would have been incredibly standardized when -- 02:16
9 given that time frame, it would have been just 02:16
10 exceedingly unlikely outside of various 02:17
11 hypothetical and very theoretical cases to do 02:17
12 something different. 02:17

13 Q. And when you say "exceedingly 02:17
14 unlikely," you mean it would have been 02:17
15 exceedingly unlikely to not have RAM and not 02:17
16 have flash? 02:17

17 A. It is possible to have systems at 02:17
18 the time without necessarily using flash. So 02:17
19 you could have done a system potentially with 02:17
20 both RAM and ROM. We can think of flash as 02:17
21 being a very particular type of ROM in a very 02:17
22 broad sense. 02:17

23 But would have always had some sort 02:17
24 of -- pretty much all systems always have some 02:17
25 sort of RAM and some sort of ROM, particularly 02:17

1 given the connectivity that you might have and 02:17
2 that you have a device that's -- that's not 02:17
3 tethered to, say, with an always on wireless 02:17
4 connection. And even -- even in a system like 02:17
5 that, you would still have RAM and ROM for 02:17
6 those particular roles. 02:17

7 Q. And in the system that you describe 02:18
8 in paragraph 42, does the -- strike that. 02:18

9 And in the system that you describe 02:18
10 here in paragraph 42, does the display 02:18
11 buffer -- strike that. 02:18

12 In the system you describe in 02:18
13 paragraph 42, is the display buffer that you 02:18
14 describe used to store information associated 02:18
15 with displays other than the trend graph 02:18
16 displays? 02:18

17 A. So just if I understand your 02:18
18 question correctly -- and just to clarify, too, 02:18
19 I do expand beyond 42 in terms of the -- what I 02:18
20 would believe that the Paradigm system is doing 02:18
21 underneath. 02:18

22 I describe in much more detail, in 02:18
23 later paragraphs, in terms of some of those 02:18
24 decisions and why you might make some of those 02:18
25 decisions on its own. I want to make sure 02:18

1 we're not just limited to paragraph 42. 02:18

2 But if one is using, say, a display 02:19
3 buffer for those particular purposes, the 02:19
4 display buffer could potentially be used to 02:19
5 display those trend graphs. It could also be 02:19
6 used for some of those other elements. 02:19

7 Although as we discussed earlier, 02:19
8 that particular display buffer may or not be 02:19
9 needed, depending upon the programming 02:19
10 primitives one might have had present on the 02:19
11 display. The LCD display and its respective 02:19
12 controller, that display buffer may or may not 02:19
13 have been needed at that time; and then also, 02:19
14 subject to the constraints of what was needed 02:19
15 to render the information or compute and the 02:19
16 limited amount of memory. 02:19

17 So there is a lot of variables and 02:19
18 complexities that go into that. 02:19

19 Q. And you've mentioned the pixels 02:19
20 several times. How many pixels did the 02:19
21 Paradigm device have? 02:19

22 A. So I believe later, I had discussed 02:19
23 in my report with regards to trying to measure 02:20
24 and derive, roughly speaking, from that what I 02:20
25 would believe is a typical screen size circa 02:20

1 kind of 2009 and a typical pixel density. 02:20

2 It is somewhat limited when we look 02:20
3 at that, particularly given LCD technology in 02:20
4 terms of the number of pixels. I believe I had 02:20
5 estimated later in my report, trying to look at 02:20
6 from the figure and trying to estimate what the 02:20
7 pixel count would be that you would have 02:20
8 available for a particular trend graph. 02:20

9 Q. And what is the pixel density for 02:20
10 that Paradigm display? 02:20

11 A. I believe on this case I had 02:20
12 measured what I thought was the display. And 02:20
13 then as I had shown in the figure in 02:21
14 paragraph 52, I estimated that to be just a bit
15 over an inch.

16 (Reporter clarification.) 02:21

17 THE WITNESS: I don't have a figure. 02:21
18 This is associated with paragraph 52. 02:21

19 And looking at that and thinking 02:21
20 about the number of readings and how it 02:21
21 would go together, I believe -- I don't 02:21
22 remember if I listed exactly the pixel 02:21
23 count or my estimated pixel count. 02:21

24 I think I looked at the number of 02:21
25 pixels that would be associated with a 02:21

1 given data point as opposed to an 02:21
2 approximate pixel count. 02:21

3 BY MR. MASON: 02:21

4 Q. Okay. So you don't know what the 02:21
5 pixel density was for the Paradigm device; is 02:21
6 that correct? 02:21

7 A. I don't recall that I opined on the 02:21
8 specific pixel count. I had looked at, as I 02:21
9 described earlier, in a 24-hour graph or a 02:21
10 3-hour graph, from looking at the various 02:22
11 figures, what I thought was the ratio of -- for 02:22
12 a given point on the line graph, what that 02:22
13 would map to in terms of the number of readings 02:22
14 that would contribute to that point. 02:22

15 And particularly looking at, say, 02:22
16 for a 24-hour graph, based on what I could see 02:22
17 and interpret from the manual, how many points 02:22
18 go into a given physical point or, I guess, a 02:22
19 given pixel on the screen. 02:22

20 Q. Did you use the pixel density for 02:22
21 the Paradigm device in making that 02:23
22 determination of how many points go into a 02:23
23 given pixel on the screen? 02:23

24 A. If I understand your question 02:23
25 correctly, I used the figures. In this case, I 02:23

1 showed, generally speaking, how I measured it. 02:23
2 And then thinking through and looking at the 02:23
3 specifications of the Paradigms in it and 02:23
4 the -- the frequency, I believe it was five 02:23
5 minutes per point. 02:23

6 Then looking at that, thinking about 02:23
7 if I can kind of roughly count the number of 02:23
8 pixels I have on there. And also, doing a 02:23
9 sanity check in terms on what I understood to 02:23
10 be LCD screen density at the time, looking 02:24
11 at -- I had kind of gone through and looked at 02:24
12 some various public sorts of things just to -- 02:24
13 to do a quick sanity check on it in terms of if 02:24
14 I had, say, 24 hours of data. And I'm looking 02:24
15 at that and I'm trying to approximate how many 02:24
16 pixels I have for a given data point, what 02:24
17 would that roughly, in my -- in my best 02:24
18 estimate, be in terms of how it would manifest 02:24
19 itself on the screen. 02:24

20 Q. In this time period, 2008, 2009, 02:24
21 what was the typical pixel density for this 02:24
22 type of device? 02:24

23 A. I don't believe in here that I had 02:25
24 listed a specific pixel density as to devices 02:25
25 on that. But given the technology being an 02:25

1 LCD, I had -- using kind of my rough 02:25
2 recollection of LCDs at the time and the rough 02:25
3 pixel density, looked at that to get -- to get 02:25
4 a sense of that. And it's not great, given 02:25
5 one inch by half inch in terms of the number of 02:25
6 pixels that one is able to show. 02:25

7 You know, typically, in systems like 02:25
8 this, you're limited in part based on how you 02:25
9 might like the display. So, you know, I've 02:25
10 just taught a course, in fact, this last 02:25
11 summer, talking about some of the differences 02:25
12 on, say, like an LCD display and whether to use 02:26
13 things like a reflective or transmissive kind 02:26
14 of approach in terms of what you can reasonably 02:26
15 perceive on it. 02:26

16 You're also subject to the power. 02:26
17 More pixels is typically going to be not just a 02:26
18 linear, but potentially a significant increase 02:26
19 in terms of power that you have. And you have 02:26
20 these, as we talked about earlier, the notion 02:26
21 of tradeoffs on it. 02:26

22 But there is not a lot of screen 02:26
23 real estate there, just being just a bit over 02:26
24 an inch by a half inch. And thinking about, at 02:26
25 the time, screens that I had seen as well as 02:26

1 just looking at, again, the figures, the 02:26
2 density is not incredibly high. 02:26

3 Q. Is the display buffer that you 02:27
4 describe in your report sometimes also referred 02:27
5 to in the art as a frame buffer? 02:27

6 A. One could potentially use a -- the 02:27
7 term "frame buffer." Potentially, frame 02:27
8 buffer, though, can have a much broader term. 02:27
9 Sometimes you would use frame buffer to refer 02:27
10 to communications. 02:27

11 And so you might refer to a -- it 02:27
12 would depend upon the context. And it would be 02:27
13 important to get the notion of are you 02:27
14 referring to communications or displays when 02:27
15 thinking about that buffer. 02:27

16 MR. MASON: All right. I think we 02:27
17 can take a break. 02:27

18 (Recess had.) 02:39

19 MR. MASON: We can go back on the
20 record. 03:00

21 BY MR. MASON: 03:00

22 Q. Are you ready to resume your 03:00
23 deposition, Dr. Striegel? 03:00

24 A. I am. 03:00

25 Q. Great. And when we were on break, 03:00

1 did you discuss the substance of your testimony 03:00
2 with counsel? 03:00

3 A. I did not. 03:00

4 Q. Okay. Before we broke, you were, I 03:00
5 think, at some point discussing and rendering 03:00
6 the letter "S" from your last name on a screen. 03:01
7 Do you know how many pixels would be required 03:01
8 to render a letter "S" on an LCD? 03:01

9 A. So it would depend, again, kind of 03:01
10 on the screen and kind of the font size, if you 03:01
11 will, that you might want to do and how you 03:01
12 might kind of render it. 03:01

13 So do you want something in more 03:01
14 like a serif-style kind of font, or do you want 03:01
15 to kind of do a very almost crude like a -- if 03:01
16 you think kind of old-school calculator, a 03:01
17 seven-segment display, you can still render 03:01
18 something that looks like an "S." It will kind 03:01
19 of depend upon that. 03:01

20 And also, the contrast you might 03:01
21 have on your display, how good it's -- you 03:01
22 know, if you're -- depending upon if you're 03:01
23 using a reflective or transmissive type of 03:01
24 display, kind of what kind of contrast you 03:01
25 might be able to get to. 03:01

1 Q. Yeah.

2 A. And then, again, what is your user 03:01
3 population, as well, too? Are you going to 03:02
4 have younger kids or folks maybe like us, who 03:02
5 maybe need a little bit better or larger font? 03:02
6 Like nowadays on our phone, we might make 03:02
7 the -- the extra big letters or such on that. 03:02

8 Q. Okay. Yeah, okay. I mean, yeah, so 03:02
9 is it -- it's hard to -- strike that. 03:02

10 Is it your testimony, then, that you 03:02
11 just don't know how many pixels would 03:02
12 require -- like the minimum number of pixels 03:02
13 that would be required to render an "S" on an 03:02
14 LCD? 03:02

15 A. I could probably go through and 03:02
16 conduct that analysis, but I would need to take 03:02
17 a bit of pencil and paper and try to figure 03:02
18 out. And it -- it would also depend upon what 03:02
19 else you're rendering as well too. 03:02

20 And again, as I talked about, the 03:02
21 lighting and who might be using your system and 03:02
22 their visual acuity that they might have, all 03:02
23 of those would play a role. 03:02

24 Q. Okay. 03:02

25 A. If you think of it a little bit like 03:03

1 an eye-chart test. If you have really good 03:03
2 vision, you can probably make it very small. 03:03

3 There is also factors such as cost 03:03
4 in terms of the fidelity you might need for 03:03
5 like an LCD. And also, it would depend, are 03:03
6 you doing, say, strictly like an LCD versus an 03:03
7 LED, getting into aspects such as contrast, and 03:03
8 if you have any kind of bleed over from one 03:03
9 pixel to the other and kind of what you can 03:03
10 visually pick out well. 03:03

11 Q. And then do you recall, prior to our 03:03
12 break, discussing your experience with 03:03
13 heart-rate monitors? 03:03

14 A. I do recall some of that. 03:03

15 Q. Yeah. And just to clarify, was it 03:03
16 your opinion that that experience kind of makes 03:03
17 you qualified to -- to offer your opinions 03:03
18 here? 03:03

19 A. It certainly helps inform in that I 03:03
20 have used my expertise both in terms of 03:03
21 understanding the capabilities of those 03:03
22 devices, the various tradeoffs that come 03:04
23 intrinsically with said device in terms of 03:04
24 maybe how much data they might have, the 03:04
25 battery-life time, and the types of scenarios 03:04

1 that we might do. Those all help inform. 03:04

2 And they largely comport with my 03:04

3 understanding that I already had before I had 03:04

4 started to use some of the different kinds of 03:04

5 devices, just generally from embedded systems 03:04

6 in terms of kind of what might you be able to 03:04

7 store plausibly, what might be tradeoffs in 03:04

8 terms of, say, like a lifetime of a device. 03:04

9 Particularly, for our studies, we're 03:04

10 very concerned about lifetime and duration; 03:04

11 when we have a long-running study, how long a 03:04

12 battery charge might last. And there's always 03:04

13 tradeoffs in devices in form factor, whether 03:04

14 you display or not, and the types of fidelity 03:04

15 and quality of information you get. 03:04

16 Kind of trying to find that sweet 03:04

17 spot can be challenge in terms of what you 03:05

18 might want to target in a typical use case. 03:05

19 Q. Okay. So it's your opinion that at 03:05

20 least some of those skills then translate to 03:05

21 this context of analyzing glucose information; 03:05

22 is that correct? 03:05

23 A. They would translate in the sense 03:05

24 that I would have a very good sense of the 03:05

25 tradeoffs in the underlying technology. Kind 03:05

1 of if -- if we step back from the glucose 03:05
2 sensor, we say if the glucose sensor is feeding 03:05
3 out data to the system and we're thinking about 03:05
4 processing transmission or receipt of
5 communications --

6 (Reporter clarification.) 00:43

7 THE WITNESS: Okay. So if we think 03:05
8 of the glucose sensor as being data that 03:05
9 would come out, a potential sensor, I would 03:05
10 be very familiar with how we would process 03:05
11 the data, where we might store the data, 03:05
12 whether it should be at RAM or ROM or 03:06
13 flash. 03:06

14 And then if we would choose to 03:06
15 display the data, thinking about the form 03:06
16 factor and the constraints that we might 03:06
17 have from power and all of those -- 03:06
18 those -- what are effectively engineering 03:06
19 tradeoffs. 03:06

20 When we go to design a system, the 03:06
21 tradeoffs that I've seen in the heart-rate 03:06
22 sensors and wearable sensors, those all 03:06
23 comport with my knowledge that I already 03:06
24 had from working with embedded systems and 03:06
25 affirm those -- those views of system 03:06

1 design. 03:06

2 BY MR. MASON:

3 Q. Okay. And would the same be true of 03:06

4 the other technology that you described 03:06

5 relating to -- I forget the term, but off 03:06

6 sensors that were -- what was the term you used 03:06

7 to refer to sensors that were away from the 03:06

8 body? 03:06

9 A. So we call those "standoff sensors." 03:06

10 Q. Yeah, standoff sensors. Thank you. 03:07

11 So my question is: Would what you 03:07

12 just described in terms of the tradeoffs and 03:07

13 that experience be true of the standoff 03:07

14 technology and analyzing the data associated 03:07

15 with that? 03:07

16 A. Yes, in the sense that a standoff 03:07

17 sensor effectively can leave many of those 03:07

18 constraints behind because it's not needing to 03:07

19 be carried by a person. So often, that means 03:07

20 some of the form factor or power constraints 03:07

21 can disappear. 03:07

22 But we still have to be often very 03:07

23 mindful of cost; and particularly, for a 03:07

24 standoff sensor is placement. So -- so now we 03:07

25 have to look at can we cover an area where 03:07

1 somebody might be versus if you carry 03:07
2 something, I know it's always on you and I 03:07
3 don't have to worry about, say, if I want to 03:07
4 measure, say, is a person present in a room. 03:07

5 If I wanted to map, say, this entire 03:07
6 floor in a standoff way, I would have to put 03:07
7 sensors in each room versus just a sensor that 03:08
8 you carry. And there is always tradeoffs that 03:08
9 I have to think about with costs and accuracy 03:08
10 in, say, a -- a study or just a general usage 03:08
11 study. 03:08

12 Q. And did I understand your testimony 03:08
13 before to explain that the medical-sensing 03:08
14 technology you worked on involved also just 03:08
15 data collected from cell phones or other 03:08
16 devices -- strike that. 03:08

17 Did I understand your testimony 03:08
18 before to be that the medical-sensing 03:08
19 technology you worked on involved data 03:08
20 collected from cell phones? 03:08

21 A. So I don't know if I would say that 03:08
22 the sensing data from cell phones would rise to 03:08
23 the level of what I would call kind of medical 03:08
24 grade or clinical grade precision. But 03:08
25 certainly there would be sensors present on a 03:08

1 phone that are often a bit coarser or perhaps 03:08
2 said to have additional tradeoffs to be able to 03:09
3 fit on a phone. 03:09

4 We used data from, say, a phone to 03:09
5 often augment some of the wearable sensors to 03:09
6 provide, often, context of what a person might 03:09
7 be doing. For instance, we had used 03:09
8 smartphones to help correct results from 03:09
9 consumer-grade wearables for the purposes of 03:09
10 sleep. Because they would often struggle with, 03:09
11 are you laying in bed watching -- watching 03:09
12 movies on your smartphone, or are you actually 03:09
13 asleep? 03:09

14 Oftentimes, just a consumer-grade 03:09
15 wearable would struggle. And we could correct 03:09
16 sleep sensing by bringing in what's not 03:09
17 necessarily a medical signal, but knowing is 03:09
18 your phone on or off can help us discern were 03:09
19 you awake or asleep, to a large extent. 03:09

20 Q. Just for the record, I want to say 03:10
21 that I never just sit on the couch and read my 03:10
22 phone. 03:10

23 All right. So -- okay. And then -- 03:10
24 yeah. And I guess the data that you're 03:10
25 collecting from these smartphones then, in that 03:10

1 experience, that also sort of informs your 03:10
2 opinions that you offered in your declaration? 03:10

3 A. It can help inform the opinions in 03:10
4 the sense that smartphones are highly capable 03:10
5 devices. And we want to be -- I want to offer 03:10
6 just a little bit of a caveat, in that, say, a 03:10
7 display that we have on a smartphone is not the 03:10
8 same as some of the displays we're talking 03:10
9 about here. In the computational capacited 03:10
10 storage, they're kind of incredible marvels in 03:10
11 that they have gigabytes of storage and 03:10
12 processors that run way beyond what I think 03:10
13 anybody would have envisioned back when I was 03:10
14 in school as an undergrad, that they're just 03:11
15 incredibly powerful because of the roles that 03:11
16 they seek to do. 03:11

17 And when we had used them in our 03:11
18 sensors, we often used them as kind of 03:11
19 ancillary sensors to -- to -- as I talked 03:11
20 about, to provide context of things like maybe 03:11
21 where are you at, are you in proximity, are you 03:11
22 texting others to kind of help us out. 03:11

23 But they often -- they were rarely 03:11
24 the kind of primary sensing stream, if you 03:11
25 will, because they were often not gathering the 03:11

1 specific health-related data that we would get 03:11
2 much better from a wearable. It was more of a 03:11
3 corrective or contextual piece of information. 03:11

4 Q. Okay. So the -- yeah. 03:11

5 Is it fair to say, then, that 03:11
6 collecting and analyzing that data from the 03:11
7 smartphones was maybe the part of your 03:11
8 experience that's sort of related to your 03:11
9 relevant opinions here? 03:11

10 A. It can, in that those sensing 03:12
11 streams can help inform. But again, putting in 03:12
12 the caveat that often smartphones are kind of 03:12
13 radically overpowered often for just sensing, 03:12
14 compared to what we might have in a much 03:12
15 smaller form factor, a much more reduced form 03:12
16 factor. Especially if you look, say, at circa 03:12
17 2009 or earlier, we didn't quite have nearly as 03:12
18 capable of -- of portable devices like we might 03:12
19 have now. 03:12

20 Q. Can I invite you to paragraph 48 of 03:12
21 your declaration? 03:12

22 A. Sure. 03:12

23 Q. And can I just have you read that 03:12
24 first sentence in paragraph 48? 03:12

25 A. Sure. And I think that's the only 03:12

1 sentence. 03:12

2 So we see in paragraph 48: In this 03:12
3 system, comma -- and this is talking about the 03:12
4 system in kind of a normal operation -- the 03:12
5 data received by the transmitter would also be 03:13
6 stored in the long-term memory, i.e., would be 03:13
7 duplicated once received. 03:13

8 Well, I guess it was more than one 03:13
9 sentence. 03:13

10 Q. That's fine, yeah. 03:13

11 A. I was afraid it was one giant 03:13
12 sentence only in the paragraph. 03:13

13 Q. Is the data received by the 03:13
14 transmitter in this system stored in the 03:13
15 long-term memory first? Or is it stored in the 03:13
16 display buffer first? 03:13

17 A. So in this case -- 03:13

18 MR. HANSEN: Objection as to form. 03:13

19 THE WITNESS: As I describe in my 03:13
20 paragraph here and I say the data received 03:13
21 by the transmitter, and it's probably a bit 03:13
22 more accurate to say the data received by 03:13
23 the transceiver, just because transmitter 03:14
24 usually doesn't receive. So saying 03:14
25 transceiver would be more accurate. 03:14

1 I say that it would also be stored, 03:14
2 that it would be duplicated once received. 03:14
3 And in the broader context, what I'm 03:14
4 referring to here is -- is, again, during 03:14
5 kind of normal operation what would be 03:14
6 going on. 03:14

7 And that long-term memory, we can 03:14
8 think of that much like a -- almost like a 03:14
9 log on that, if we think about the 90 days' 03:14
10 worth of data when we're thinking about the 03:14
11 CareLink data, the data downloaded by 03:14
12 CareLink, in that it's -- we're thinking 03:14
13 about long-term memory or sort of long-term 03:14
14 storage in this paragraph, is what I'm 03:14
15 talking about. 03:14

16 BY MR. MASON: 03:14

17 Q. Okay. And in this paragraph 48, 03:14
18 does the duplication here refer to copying the 03:15
19 data that's been stored in long-term memory to 03:15
20 the SRAM display buffer? 03:15

21 A. So I think we want to be careful, as 03:15
22 we kind of talked about extensively with the 03:15
23 display buffer. 03:15

24 So in this case, we're talking about 03:15
25 data. This is data being received by, in this 03:15

1 case, the Paradigm system. So data is going to 03:15
2 be received. 03:15

3 In a typical case on a system like 03:15
4 this, you would often receive it from, say, 03:15
5 your communication port, however it would come 03:15
6 in. In this case, it's wireless as it would 03:15
7 come in. Because we're talking about a 03:15
8 transceiver. 03:15

9 Oftentimes, the CPU would need to 03:15
10 move that data to the RAM. That would be data 03:15
11 as in like raw data. So this would be data 03:15
12 that's coming in directly from the -- the 03:16
13 glucose sensor. 03:16

14 It would be put into RAM. From 03:16
15 there, the question would be is -- where would 03:16
16 it go after -- after that. So effectively, 03:16
17 we've read it in; it's been put into a buffer, 03:16
18 not necessarily the display buffer. That's a 03:16
19 different usage of parts of memory. And then 03:16
20 from there, it would need to be placed wherever 03:16
21 would be appropriate. 03:16

22 So if we think about our long-term 03:16
23 memory, effectively if we think towards the 03:16
24 90 days that's talked about in the CareLink 03:16
25 software is, I mentioned the notion of 03:16

1 nonvolatile storage or kind of a way to save 03:16
2 all of our data. Based on my interpretation of 03:16
3 the manual and the -- kind of the broader kinds 03:17
4 of functionalities they talk about, they 03:17
5 mentioned the 90 days for -- for saving. 03:17

6 So in a typical system design, I 03:17
7 would view that as the data would come in; and 03:17
8 we want to make sure, no matter what, it's 03:17
9 saved somewhere so it will be around for later. 03:17
10 So one of the -- the most important things is 03:17
11 to -- is to save it because it's data from the 03:17
12 sensor -- in this case being the glucose 03:17
13 sensor -- which, again, I'm not a clinician. 03:17

14 But from just an instrumentation 03:17
15 standpoint, I would say, hey, this is important 03:17
16 data. I need to make sure it's never lost, so 03:17
17 I want to stick that in the long-term storage 03:17
18 no matter what. 03:17

19 It would have traversed the SRAM, 03:17
20 but not necess- -- there's no guarantee that it 03:17
21 would have traversed the display buffer because 03:17
22 it -- depending upon when it would arrive, the 03:17
23 user could have been doing other things. 03:17
24 Depending upon what the display is showing, it 03:17
25 may have -- it may never make its way into the 03:17

1 display buffer itself. 03:18

2 And again, on a display buffer, the 03:18
3 display buffer is what I want to show; and it 03:18
4 is not necessarily -- the display -- what I'm 03:18
5 going to show on the screen is often involving, 03:18
6 probably, an element of processing in that it's 03:18
7 not just the raw data. And again, I'm not a 03:18
8 clinician; but from what I understand, thinking 03:18
9 about systems at the time, there's various 03:18
10 calibration points in trying to figure out is 03:18
11 the glucose -- are the glucose readings right 03:18
12 or wrong, and that that -- particularly, the 03:18
13 technology at that time was a bit more 03:18
14 primitive than what we might be seeing today. 03:18

15 And then, it required more -- 03:18
16 significantly more calibration points to make 03:18
17 sure that it was correct or processed, usually 03:18
18 involving things like fingersticks. But 03:18
19 those -- that processing would still need to 03:18
20 happen. But for, say, like a long-term memory 03:19
21 where I'm going to save it, simply saving the 03:19
22 raw data would be more than appropriate. 03:19
23 Because I can always process it later, 03:19
24 potentially on a more capable machine than what 03:19
25 I might have on the insulin pump. 03:19

1 Q. So just so I understand correctly, 03:19
2 you're -- are you saying that the raw data 03:19
3 would either be stored directly on the flash or 03:19
4 potentially it would be processed and then 03:19
5 stored in the flash? 03:19

6 A. So I think the -- we want to think 03:19
7 of it as we have a long-term storage that could 03:19
8 be flash, could be just a ROM. There is a lot 03:19
9 of different ways you can kind of do a 03:20
10 long-term storage. 03:20

11 Flash, at the time, probably would 03:20
12 make just pretty reasonable sense in terms of 03:20
13 what you might use, although it might just be a 03:20
14 ROM, which has a little bit different way. But 03:20
15 generally speaking, the transmitter or you 03:20
16 would -- you would -- data would come in; it 03:20
17 would need to kind of be in SRAM for a very 03:20
18 brief amount of time. 03:20

19 We talked about earlier the notion 03:20
20 of storing variables or storing those sorts of 03:20
21 things. So your communication port comes in. 03:20
22 I need to put it, probably, in memory somewhere 03:20
23 temporarily. And then, I would have that 03:20
24 long-term memory effectively being what I might 03:20
25 write of. 03:20

1 You might think of it kind of like a 03:20
2 tape on a cash register or something like that 03:20
3 where I'm logging everything that I want to 03:20
4 keep. And then I may also add in what I might 03:20
5 have processed that data to be, as well, into 03:20
6 the long-term storage. That could happen. 03:20

7 It could also not on that. Because 03:21
8 for the long-term data, you have the -- more 03:21
9 likely than not, you're going to download that 03:21
10 via CareLink to a much more capable machine. 03:21
11 And so doing that processing or calibration or 03:21
12 even bringing in other data would imminently be 03:21
13 very possible as part of that. 03:21

14 And as I understand, CareLink would 03:21
15 typically be like with a physician or a 03:21
16 clinician; and they would also have additional 03:21
17 expertise that they could bring to bear on that 03:21
18 in terms of interpreting maybe that raw data on 03:21
19 it. 03:21

20 There is nothing precluding you from 03:21
21 also logging the -- the processed data, if you 03:21
22 will. But generally speaking, I would expect 03:21
23 on a system, you would -- you would always 03:21
24 write that raw data, plus with the potential to 03:21
25 write other things. 03:21

1 Q. Okay, yeah. 03:21

2 And just for clarification, the RAM 03:21
3 that is used for very temporary storage when 03:22
4 data is coming in on a comm's port, that data 03:22
5 is different from the display buffer that we 03:22
6 discussed earlier, correct? 03:22

7 A. So in a system -- 03:22

8 Q. Or strike that. Maybe -- I'll just 03:22
9 ask it a different way. 03:22

10 When things are coming in via the 03:22
11 communications port and you're storing it in 03:22
12 RAM, were you meaning to say that that data was 03:22
13 stored at the display buffer? 03:22

14 A. No. I don't think I would 03:22
15 characterize it that way. So we can think 03:22
16 of -- if I have a communications port, 03:22
17 oftentimes a communication port will have a 03:22
18 little bit of memory, kind of a buffer in and 03:22
19 of itself. We talked earlier about that notion 03:22
20 of a frame buffer. 03:22

21 Q. Mm-hmm.

22 A. So sometimes, they'll have small 03:22
23 buffers both on inbound data you're receiving, 03:22
24 as well as data on the outbound. So sometimes 03:22
25 that kind of on the serial or wireless part of 03:22

1 the chip, you might have some small kind of 03:23
2 memory associated with that device. 03:23

3 That memory, if you will, or that 03:23
4 buffer on the port could be read by the 03:23
5 processor. It has the choice of it could 03:23
6 immediately put that only to the long-term 03:23
7 storage. It could also put that in the RAM, if 03:23
8 you will, kind of the memory, kind of working 03:23
9 memory, if you will, being that SRAM, or that 03:23
10 limited amount of memory that's fast and tends 03:23
11 to not have a high cost for reading and writing 03:23
12 versus, say, something like a ROM or a flash, 03:23
13 which that -- that write action might -- is 03:23
14 usually -- read or write is usually slower and 03:23
15 usually a little bit higher cost on power 03:23
16 consumption. 03:23

17 So I have kind of different parts. 03:23
18 And if we think of RAM conceptually, we think 03:24
19 of kind of the memory that I have for doing 03:24
20 things. Part of it can be used for a display 03:24
21 buffer. Part of it can be used just for 03:24
22 storage of variables, of which one of those 03:24
23 things could be data that was temporarily 03:24
24 stored inside of that memory. 03:24

25 So -- but the nuance of the system, 03:24

1 depending upon how you write the code, 03:24
2 sometimes you could just choose to have it come 03:24
3 into the registers on your processing unit and 03:24
4 never even go to memory, if you wanted to do 03:24
5 that, if you wanted to avoid that step. 03:24

6 There's kind of a lot of different 03:24
7 choices on how you might write the code. But, 03:24
8 generally speaking, it would -- you'd probably 03:24
9 take from the communications port and 03:24
10 temporarily put it in RAM. And then from 03:24
11 there, you might push it out to, say, your 03:24
12 flash or your long-term storage. 03:24

13 Q. And then from that flash or other 03:24
14 long-term storage, it would be duplicated to 03:24
15 your display buffer? Do I understand that 03:25
16 correctly? 03:25

17 A. No. I don't think I would view that 03:25
18 in that lens where I would duplicate it to the 03:25
19 display buffer. 03:25

20 Earlier, we talked about that notion 03:25
21 of the display buffer effectively being what I 03:25
22 might render on the screen. So if I'm 03:25
23 rendering, say, a trend graph with the 03:25
24 different pixels, that's kind of the 03:25
25 representation of what might need to go out 03:25

1 there. 03:25

2 So I can think of my RAM as being 03:25
3 space that I could use for a variety of 03:25
4 purposes, one of which might be a display 03:25
5 buffer, the other which might be for storage of 03:25
6 data or variables -- kind of temporary sorts of 03:25
7 things. 03:25

8 And then we talked about the notion 03:25
9 of a scratch pad. So I can think of the 03:25
10 display buffer as being targeted at things that 03:25
11 I might want to just put on the display; but I 03:25
12 can also have variables, generally speaking, 03:25
13 of, hey, you're in this menu or the name of the 03:26
14 user is Aaron. 03:26

15 Q. Okay. 03:26

16 A. And so I might want to leave those 03:26
17 things maybe in memory as part of that RAM, 03:26
18 that part of the -- that specific part of that 03:26
19 RAM when we're thinking about memory, to just 03:26
20 leave it in there for whatever purposes might 03:26
21 be. 03:26

22 And it's up to the programmer to 03:26
23 decide, usually given the fact that I have a 03:26
24 limited amount of RAM, what needs to go in 03:26
25 there. Especially if I'm running out, then I 03:26

1 have to make some really hard choices of what I 03:26
2 want to keep in there versus what might need to 03:26
3 live someplace else. 03:26

4 Q. Okay. And if a user of this device 03:26
5 wanted to display information that was not 03:26
6 currently in the display buffer, where would 03:26
7 that information come from? 03:27

8 A. So I think you want to be careful on 03:27
9 how you describe that. So a user doesn't 03:27
10 really choose to do things that are not in the 03:27
11 display buffer. The user chooses how to 03:27
12 interact with the system. 03:27

13 The code that's on the system would 03:27
14 then decide where to draw data from or what to 03:27
15 have in memory and then could use that display 03:27
16 buffer, in essence, just to choose what to show 03:27
17 on the display. 03:27

18 So it's not so much that the user 03:27
19 chooses what to put in the display buffer. The 03:27
20 user elects to do an action, like tap to the 03:27
21 left, tap to the right, tap up, tap down, or 03:27
22 enter, which then causes them to navigate kind 03:27
23 of the GUI or interface that's presented to the 03:27
24 user. And then the code that's running would 03:28
25 then choose how to use that memory on whatever 03:28

1 would kind of make sense. 03:28

2 Q. Okay. You also describe in 03:28
3 paragraph 48 a circumstance in which, quote, 03:28
4 the power is cycled. 03:28

5 A. Mm-hmm. 03:28

6 Q. Do you see that in your second 03:28
7 sentence? 03:28

8 A. I do see the phrase "power is 03:28
9 cycled." 03:28

10 Q. And by power is cycled, do you mean 03:28
11 that the device loses power and then power is 03:28
12 restored? 03:28

13 A. Typically, when we think about a 03:28
14 power cycle, it could be I lost power, maybe 03:29
15 the battery ran out or was too low or it was 03:29
16 cut off. 03:29

17 There could be other things, glitchy 03:29
18 circuits, those things. One would hope on a 03:29
19 system like this, those are kind of well-built 03:29
20 and well-protected. 03:29

21 There could be also where you might 03:29
22 have a switch, where a hard switch would 03:29
23 actually -- like an on/off where it would 03:29
24 physically cut off the circuit on it as opposed 03:29
25 to like a soft reset, where you might just 03:29

1 signal to the processor to reboot. 03:29

2 So when we're thinking about power 03:29
3 cycling, usually we're thinking about that the 03:29
4 battery has drained or has gotten too low; or 03:29
5 there is a hard physical switch that does the 03:29
6 equivalent of making an open circuit so there 03:29
7 is no power on it. 03:29

8 And so we think of a power cycling 03:29
9 as kind of the classic case. When you call 03:29
10 tech support, the first thing -- the first 03:29
11 question they always ask you is, well, did you 03:29
12 turn it on and off again? We can kind of think 03:30
13 of a power cycle as being something like that. 03:30

14 Q. Okay. And is it your testimony 03:30
15 here, in paragraph 48, that the data in the 03:30
16 display buffer is lost when the device goes 03:30
17 through a power cycle? 03:30

18 A. Since the data for the display, as I 03:30
19 described earlier, would live in the RAM, a 03:30
20 power cycle more often than not would then end 03:30
21 up having the RAM lose whatever it would have. 03:30
22 Because it would have lost power, and now it no 03:30
23 longer maintains it. That's why we call it 03:30
24 volatile memory. And so then it would lose 03:30
25 whatever is going on. 03:30

1 There are systems where you can 03:30
2 actually have primary power and backup power, 03:30
3 so where you could have like a -- kind of like 03:30
4 an intermediate coin cell or something that may 03:30
5 keep you alive. Even if it -- even if it goes 03:31
6 down, you could maintain it on it. 03:31

7 I don't recall seeing something like 03:31
8 that in the specification or the -- the 03:31
9 documentation for the Paradigm. So I don't 03:31
10 think something like that would have been 03:31
11 present, but it is possible sometimes to have 03:31
12 like a main battery and a secondary battery to 03:31
13 even tolerate losing power on the first one and 03:31
14 not lose what's in RAM. 03:31

15 But at least in the system as I 03:31
16 understood it and as I read through the 03:31
17 documentation, I would presume that if you 03:31
18 pulled out the battery, and you did and RAM is 03:31
19 gone. 03:31

20 Q. And in that system when power is 03:31
21 cycled, then would the user be unable to view 03:31
22 past glucose data? 03:31

23 A. So which part of the cycling are you 03:31
24 talking about? 03:32

25 Q. Yeah, so I'm saying -- yeah. 03:32

1 Am I correct that after a power 03:32
2 cycle, the display buffer would lose all data? 03:32

3 A. So what would end up happening is -- 03:32
4 is that -- in this case and what this paragraph 03:32
5 is getting at is, I want to save data always in 03:32
6 a long-term or a nonvolatile sort of thing. 03:32

7 The display buffer is -- is only 03:32
8 used for the purposes of kind of prerendering, 03:32
9 if you will -- we talked about the display 03:32
10 buffer, the frame buffer -- what I want to show 03:32
11 on the screen. 03:32

12 So after a power cycle, the system 03:32
13 has booted back up. And it, again, is -- once 03:32
14 again, because I have power, it is now driving 03:32
15 the display. And it has a display buffer that 03:32
16 it can be using or, in the cases we talked 03:32
17 about where you might not need to have 03:32
18 necessarily a big display buffer or anything at 03:32
19 all on that, where you could just directly 03:33
20 drive the controller. 03:33

21 In that case, there would have been 03:33
22 storage that likely would have been referenced 03:33
23 because that's -- that's nonvolatile, that 03:33
24 keeps around past things. Because as a user, I 03:33
25 probably will need to put in a new battery; and 03:33

1 so I want to make sure. 03:33

2 That's why we put it in nonvolatile 03:33

3 storage, to make sure that the data persists 03:33

4 even if my battery runs out. And so as the 03:33

5 system would boot up, it would typically have 03:33

6 some aspects where it might read from some of 03:33

7 the non- -- some, maybe not all, of the 03:33

8 nonvolatile storage to basically kind of heal 03:33

9 itself, if you will, or kind of read up. 03:33

10 That's why we put things in some sort of a 03:33

11 nonvolatile storage, so we can read it such 03:33

12 that post power boot-up, just like the code 03:34

13 would be preserved in some sort of a 03:34

14 nonvolatile storage, the data could also be 03:34

15 preserved and -- potentially preserved in 03:34

16 multiple locations, where I might, after a 03:34

17 power cycle, be able to effectively read that 03:34

18 and then, as part of my normal system 03:34

19 operation, be able to render the display buffer 03:34

20 and then show that on the screen. 03:34

21 Q. So after a power cycle happened, 03:34

22 would a user be able to view trend graphs of 03:34

23 past glucose data in your system? 03:34

24 A. Well, so we're talking about the 03:34

25 Paradigm system on that. So in the Paradigm 03:34

1 system, if I were to, say, remove the battery 03:34
2 and put in a new AAA battery, the system would 03:34
3 come back up. 03:34

4 Again, it would depend somewhat on 03:34
5 how long it took or when you -- when you did 03:34
6 it. But then as it were to come back up, it 03:34
7 would basically resume where it was before, 03:35
8 usually after a period of boot time. 03:35

9 So many systems with the display, 03:35
10 you might turn it on and it might say something 03:35
11 like, hey, I'm -- I'm this system with this 03:35
12 version. We call it sometimes a splash screen 03:35
13 as it turns on. And then it would resume 03:35
14 normal operation. 03:35

15 And in particular, in this 03:35
16 paragraph, I'm commenting on kind of normal 03:35
17 operation to start and then, also, the 03:35
18 rationale of why you're using that nonvolatile 03:35
19 storage. Because you will lose power, and you 03:35
20 will need to -- as part of normal operation, 03:35
21 you'll need to resume working to be useful to 03:35
22 the user. 03:35

23 MR. HANSEN: Counsel, are we 03:35
24 reaching a point where we can take a lunch 03:35
25 break? 03:35

1 MR. MASON: Yeah. Probably just 03:35
2 like ten more minutes or so, Leland, 03:35
3 something like that. 03:35

4 BY MR. MASON: 03:35

5 Q. So and then after -- okay, just so I 03:35
6 understand -- I think I understand how this 03:35
7 works now. So -- strike that. 03:35

8 After a power cycle, am I correct, 03:36
9 then, that any data needed for a display would 03:36
10 be copied from nonvolatile memory into the 03:36
11 display buffer, from which it could be rendered 03:36
12 on a screen? 03:36

13 A. So I would describe it a little bit 03:36
14 different than that. So if we think about our 03:36
15 system as having RAM, which is kind of our 03:36
16 small scratch pad, of which part of that RAM 03:36
17 is -- is the display buffer scratch pad, if you 03:36
18 will, in addition to the other variables that 03:36
19 we have post power cycling, what a system would 03:36
20 typically do is try to read from some of the 03:36
21 nonvolatile storage. 03:36

22 It could be nonvolatile storage 03:36
23 directly on the microcontroller. It could be 03:36
24 external nonvolatile storage. What informs me 03:36
25 a bit on that, the Paradigms actually had 03:36

1 probably multiple forms of nonvolatile memory 03:37
2 was the distinction of the 90 days versus 31 03:37
3 for a summary in terms of how it operates. 03:37

4 So post power cycling, we would -- I 03:37
5 shouldn't say we -- the system would need to go 03:37
6 out and read from nonvolatile memory to 03:37
7 basically repopulate the SRAM or repopulate 03:37
8 that working space for variables and those 03:37
9 sorts of things, which then, in turn, allows it 03:37
10 to resume whatever the normal display would be 03:37
11 such that, effectively, it comes back, if you 03:37
12 will, and it looks like it did before you 03:37
13 pulled out the battery and put in a new 03:37
14 battery; subject also to that, while I was 03:37
15 cycling the power, a new transmission didn't 03:37
16 seem to come in or those sorts of -- you know, 03:37
17 nothing was lost. 03:37

18 So we're kind of assuming that if I 03:38
19 take out the battery and I do it real quick 03:38
20 before another transmission would have come in 03:38
21 while I was effectively rebooting back up, 03:38
22 it'll kind of look like, for all practical 03:38
23 purposes, if I don't miss a new data point, it 03:38
24 will kind of be a -- a no harm, no foul, if you 03:38
25 will, in the case if I didn't miss anything. 03:38

1 MR. HANSEN: So, Andy, I actually 03:38
2 have something that I need -- something 03:38
3 else I need to attend to really quickly. I 03:38
4 can step out for just a few minutes and 03:38
5 come right back in, or we can just take a 03:38
6 lunch break right now. Either way. 03:38

7 MR. MASON: Yeah. Why don't you 03:38
8 just attend to that real quickly and 03:38
9 then -- because we --

10 Let's just go off the record. 03:38

11 Sorry. 03:49

12 (Recess had.) 03:49

13 MR. MASON: We can go back on the
14 record.

15 Dr. Striegel, I have no further 03:50
16 questions. 03:50

17 MR. HANSEN: All right. Well, let's 03:50
18 take a short break while I decide if I have 03:50
19 any redirect. 03:50

20 (Recess had.) 04:06

21 EXAMINATION 04:09

22 BY MR. HANSEN: 04:09

23 Q. So, Dr. Striegel, in your expert 04:09
24 opinion and based on the information available 04:09
25 to you when you conducted your analysis, in the 04:09

1 event of a data gap in a trend graph for the 04:09
2 Medtronic Paradigm system, does that system, 04:09
3 the Paradigm system, backfill that data gap in 04:10
4 the trend graph on the display? 04:10

5 MR. MASON: Objection. Form. 04:10
6 Scope. 04:10

7 THE WITNESS: In my expert opinion, 04:10
8 I did not see any evidence in the materials 04:10
9 that I considered that backfilling 04:10
10 occurred. 04:10

11 BY MR. HANSEN: 04:10

12 Q. And Mr. Mason asked you questions 04:10
13 about how the system would operate in the event 04:10
14 that the power was cycled; for example, if you 04:10
15 replaced the battery. Do you recall that? 04:10

16 A. I do. 04:10

17 Q. With respect to backfilling data 04:10
18 gaps in a trend graph on the display, in your 04:10
19 opinion, would the system operate any 04:10
20 differently after the power was cycled? 04:10

21 MR. MASON: Objection. Form. 04:10
22 Scope. 04:10

23 THE WITNESS: I would not expect 04:10
24 that following a power cycle on a normal 04:10
25 system, that it would behave differently. 04:10

1 MR. HANSEN: Okay. That's all I 04:11
2 have. 04:11

3 MR. MASON: Okay. I have no 04:11
4 recross. So we're done today. 04:11

5 THE REPORTER: Would you anybody 04:11
6 like rough e-mailed? 04:11

7 MR. HANSEN: Sure, we'll take one, I 04:11
8 guess. 04:11

9 MR. MASON: We'll take a rough. 04:11

10 (Deposition concluded at 1:20 p.m.)

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CERTIFICATE OF SHORTHAND REPORTER

I, JENNIFER L. BERNIER, Certified
Shorthand Reporter within and for the State of
Illinois do hereby certify:

That AARON STRIEGEL, 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 before me and is a true
record of the testimony given by such witness.

I further certify that the
deposition of AARON STRIEGEL, Ph.D., occurred
at the offices of McAndrews, Held & Malloy,
Ltd., on Wednesday, July 24, 2024 commencing at
9:16 a.m. to 1:20 p.m.

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

IN WITNESS WHEREOF, I have hereunto
set my hand this 5th of August, 2024.

Jennifer Bernier

JENNIFER L. BERNIER, CSR, RMR, CRR