Transcript of **RUDIGER L. URBANKE**

Date: February 25, 2015

Case: THE CALIFORNIA INSTITUTE OF TECHNOLOGY v. HUGHES COMMUNICATIONS, INC., ET AL

Court Reporting | Videography | Videoconferencing | Interpretation | Transcription

1   UNITED STATES DISTRICT COURT

2   CENTRAL DISTRICT OF CALIFORNIA

3   --------------------------------x

4   THE CALIFORNIA INSTITUTE   :

5   OF TECHNOLOGY,   :

6   Plaintiff, :

7   v.   :   Case No.:

8   HUGHES COMMUNICATIONS, INC.,   :   2:13-cv-07245-MRP-JEM

9   HUGHES NETWORK SYSTEMS, LLC,   :

10   DISH NETWORK CORPORATION,   :

11   DISH NETWORK, LLC, and DISHNET:

12   SATELLITE BROADBAND, LLC,   :

13   Defendants.:

14   --------------------------------x

15

16   Videotaped Deposition of RÜDIGER L. URBANKE

17   Palo Alto, California

18   Wednesday, February 25, 2015

19   9:57 a.m.

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22

23   Job No.: 77059

24   Pages: 1 - 332

25   Reported by: James Beasley, RPR, CA CSR No. 12807

2

1   Videotaped Deposition of RÜDIGER L. URBANKE,

2 held at the offices of:

3

4

5   WILMER CUTLER PICKERING HALE AND DORR LLP

6   950 Page Mill Road

7   Palo Alto, California 94304

8   (650) 858-6000

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11

12

13   Pursuant to Notice, before James Beasley,

14 Registered Professional Reporter, California Certified

15 Shorthand Reporter, CSR No. 12807.

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25        ALSO PRESENT: JOSEPH MOURGOS, Videographer
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4

1   C O N T E N T S

2 EXAMINATION OF RÜDIGER L. URBANKE   PAGE

3   By Mr. Dowd   9

4

5   E X H I B I T S

6   (Attached to transcript)

7 URBANKE DEPOSITION EXHIBIT   PAGE

6

1   E X H I B I T S   C O N T I N U E D

2   URBANKE DEPOSITION EXHIBIT   PAGE

3   Exhibit 15   Article entitled: "Gallager   165

4   Codes Recent Results"; 12 pages.

5   Exhibit 16   Source code; 16 pages   185

6   (double-sided).

7   Exhibit 17   Article entitled: "Analysis of   215

8   Low Density Codes and Improved

9   Designs Using Irregular Graphs";

10   11 pages (double-sided).

11   Exhibit 18   E-mail from   244

12   ART@scarpia.research.bell-labs.com

13   to dariush@shanon.jpl.nasa.gov,

14   dated 4/05/1999; one page.

15   Exhibit 19   E-mail from   244

16   ART@scarpia.research.bell-labs.com,

17   sent April 05, 1999; one page.

18   Exhibit 20   Article entitled: "Design of   249

19   Provably Good Low-Density Parity

20   Check Codes"; 36 pages

21   (double-sided).

22   Exhibit 21   Article entitled: "Irregular   265

23   Turbocodes"; eight pages

24   (double-sided).

25

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 1              E X H I B I T S   C O N T I N U E D

 2   URBANKE DEPOSITION EXHIBIT                        PAGE

 3     Exhibit 22   E-mail from Brendan Frey to        287

 4                  Dariush Divsalar, dated

 5                  12/08/1999; one page.

 6     Exhibit 23   Document entitled:  "Provisional   301

 7                  Application for Patent"; 35 pages.

 8     Exhibit 24   Article entitled:  "Irregular      311

 9                  Turbo-Like Codes"; 11 pages

10                  (double-sided).

11     Exhibit 25   Document entitled:  "United        312

12                  States Patent No. 6,081,909"; 42

13                  pages (double-sided).

14     Exhibit 26   Document entitled:  "United        313

15                  States Patent No. 4,623,999";

16                  seven pages (double-sided).

17     Exhibit 27   Article entitled:  "Comparison     314

18                  of Construction of Irregular

19                  Gallager Codes"; six pages

20                  (double-sided).

21     Exhibit 28   Article entitled:  "Low Density    315

22                  Parity Check Codes with

23                  Semi-Random Parity Check

24                  Matrix"; two pages.

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2   Palo Alto, California

3   Wednesday, February 25, 2015

4   9:57 a.m.

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

7   THE VIDEOGRAPHER: Here begins Video No. I   09:56:28

8   in the videotaped deposition of Rüdiger Urbanke, in   09:56:30

9   the matter of The California Institute of Technology   09:56:35

10   versus Hughes Communications, Incorporated, et al.,   09:56:44

11   in the United States District Court, for the Central   09:56:44

12   District of California. The case number is   09:56:48

13   2:13-cv-07245-MRP-JEM.   09:56:52

14   Today's date is February 25th, 2015 and   09:57:01

15   the time on the video monitor is 9:57 a.m.   09:57:07

16   The videographer today is Joseph Mourgos,   09:57:11

17   representing Planet Depos. This video deposition is   09:57:15

18   taking place at 950 Page Mill Road, Palo Alto,   09:57:18

19   California.   09:57:24

20   Would counsel please voice identify   09:57:25

21   yourselves and state whom you represent.   09:57:30

22   MR. DOWD: Go ahead.   09:57:30

23   MR. GLASS: Sure. James Glass from Quinn,   09:57:31

24   Emanuel, Urquhart, & Sullivan, representing   09:57:34

25   plaintiff Caltech and deponent, Dr. Urbanke. With   09:57:35

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1	me today is Robert Kang, also of Quinn, Emanuel.	09:57:40
2	MR. DOWD: Jim Dowd of WilmerHale for the	09:57:42
3	defendants.	09:57:45
4	THE VIDEOGRAPHER: Thank you. The court	09:57:46
5	reporter today is James Beasley, representing Planet	09:57:48
6	Depos. Would the reporter please administer the	09:57:51
7	oath.	09:57:55
8	---	09:57:56
9	RÜDIGER L. URBANKE,	
10	being first duly sworn and/or affirmed by the	
11	Certified Shorthand Reporter to tell the truth, the	
12	whole truth and nothing but the truth, testified as	
13	follows:	
14	---	
15	E X A M I N A T I O N	
16	---	09:58:14
17	BY MR. DOWD:	09:58:14
18	Q. Good morning.	09:58:15
19	A. Good morning.	09:58:15
20	Q. Thanks for coming.	09:58:15
21	A. You're welcome.	09:58:17
22	Q. Have you ever been deposed before?	09:58:18
23	A. No.	09:58:19
24	Q. Okay. Let me just go over a few ground	09:58:20
25	rules.	09:58:22

1	Your counsel may have already discussed	09:58:23
2	this with you, but because what we say is being	09:58:25
3	taken by a court reporter, it's important that we	09:58:27
4	don't speak over one another. So I'll do my best	09:58:30
5	not to speak when you're speaking and if you could	09:58:33
6	do your best to do the same, I'd appreciate it;	09:58:35
7	fair?	09:58:39
8	A. Fair.	09:58:39
9	Q. Okay. You understand that although we're	09:58:40
10	in a conference room at the law firm of WilmerHale,	09:58:42
11	that the transcript and the video that's being taken	09:58:45
12	will actually be used in a court of law in	09:58:48
13	Los Angeles?	09:58:51
14	A. Yes.	09:58:52
15	Q. Okay. Is there any reason why you can't	09:58:53
16	provide complete and truthful answers today?	09:58:55
17	A. No.	09:58:58
18	Q. All right. You're not on any medications	09:58:59
19	or suffering from any conditions?	09:59:01
20	A. No.	09:59:03
21	Q. We'll take breaks periodically. If you	09:59:06
22	need a break, just let me know. The only thing that	09:59:09
23	I would ask, though, is that if I have a question	09:59:13
24	that is pending to you, if you could answer that	09:59:16
25	question before we take the break, and then we'll --	09:59:18

1	then we'll take the break.	09:59:19
2	Okay?	09:59:20
3	A. Understood.	09:59:21
4	Q. Okay. Could you please state your full	09:59:22
5	name for the record.	09:59:24
6	A. It's Rüdiger L. Urbanke.	09:59:24
7	Q. Where do you work?	09:59:29
8	A. At -- I'm a full professor at EPFL in	09:59:30
9	Switzerland.	09:59:34
10	Q. What do you do there?	09:59:34
11	A. I'm a full professor in the department of	09:59:35
12	computer science and communications systems.	09:59:38
13	Q. Do you work in the computer science	09:59:43
14	department?	09:59:45
15	A. It's a mixed department of communications	09:59:45
16	and computer science.	09:59:48
17	Q. Okay. And so does that mean that that	09:59:49
18	department has professors who are both in the	09:59:52
19	computer science field and in the communications	09:59:55
20	field?	09:59:58
21	A. That's correct.	09:59:59
22	Q. And you work together?	09:59:59
23	A. That's correct.	10:00:01
24	MR. DOWD: Let's mark as Exhibit 1 a copy	10:00:03
25	of your CV.	10:00:05

12

1	(Urbanke Exhibit 1 was marked for	10:00:06
2	identification and attached to the	10:00:06
3	transcript.)	10:00:34
4	(Discussion off the record.)	10:00:34
5	BY MR. DOWD:	10:00:35
6	Q.　　　Do you have before you Exhibit 1?	10:00:35
7	A.　　　Yes.	10:00:37
8	Q.　　　Do you recognize it?	10:00:37
9	A.　　　Yes.	10:00:39
10	Q.　　　What is it?	10:00:39
11	A.　　　It's a CV of -- it's my CV.	10:00:40
12	Q.　　　Is it complete?	10:00:44
13	A.　　　Could you please, you know, make it a	10:00:46
14	little bit more specific what you mean by	10:00:51
15	"complete"?	10:00:53
16	Q.　　　Is there anything that's important to your	10:00:54
17	background that's missing from this CV for the	10:00:56
18	purposes of this case?	10:01:00
19	A.　　　It's, I think, a fair representation.	10:01:01
20	There is, of course, many, many other aspects of my	10:01:04
21	professional life that I could have added, but I	10:01:07
22	wanted to keep it, you know, relatively short.	10:01:10
23	Q.　　　Okay. So Exhibit 1, was this prepared for	10:01:12
24	this case?	10:01:14
25	A.　　　Not specifically. It's a standard CV --	10:01:15

13

1	Q. And is this --	10:01:15
2	A. -- that I have.	10:01:18
3	Q. Is Exhibit 1 material that you believe	10:01:18
4	best qualifies you to be an expert in this case?	10:01:23
5	A. I think it would give a fair idea of who I	10:01:26
6	am and, you know, what my qualifications are.	10:01:30
7	Q. Okay. On Page 3 there's a list of	10:01:33
8	patents; do you see that?	10:01:38
9	A. Right.	10:01:39
10	Q. Those are all U.S. patents?	10:01:39
11	A. I believe so, yes.	10:01:42
12	Q. Those are all related to error correction	10:01:43
13	codes.	10:01:47
14	A. They're perhaps in a wider area, not just	10:01:51
15	error correction.	10:01:55
16	Q. Is any -- withdrawn.	10:01:56
17	Are any of the patents in the field of	10:01:59
18	computer science?	10:02:01
19	MR. GLASS: Objection to the extent it	10:02:01
20	calls for a legal conclusion.	10:02:05
21	THE WITNESS: I -- I'm not sure exactly	10:02:06
22	if -- if I know what you mean.	10:02:07
23	BY MR. DOWD:	10:02:08
24	Q. Have you heard -- well, withdrawn.	10:02:09
25	You used the term "computer science"	10:02:10

1	earlier today. When you used that term what did you	10:02:13
2	mean?	10:02:16
3	A. Professors in computer science.	10:02:16
4	Q. Okay. Using that same understanding, do	10:02:18
5	any of the patents that you've listed on Page 3	10:02:20
6	relate to the field of computer science?	10:02:23
7	MR. GLASS: Same objection.	10:02:26
8	THE WITNESS: Most of these patents would	10:02:44
9	probably be well characterized as relating more to	10:02:46
10	physical layer communication.	10:02:51
11	BY MR. DOWD:	10:02:52
12	Q. Physical layer communication? Did I hear	10:02:52
13	that correctly?	10:02:54
14	A. Mostly, not -- not all of them, but, you	10:02:54
15	know, it's -- it's -- that's my main area of	10:02:58
16	expertise.	10:03:02
17	Q. Okay. So your area is in the physical	10:03:02
18	layer as opposed to the MAC layer or other areas; is	10:03:05
19	that correct?	10:03:08
20	A. It's a fair assessment that most of my	10:03:08
21	work has to do with that aspect, but codes are used	10:03:11
22	in a much wider area of applications.	10:03:15
23	Q. I -- I'm just asking about your	10:03:17
24	experience. So your experience is in the PHY layer?	10:03:19
25	A. My experience has to do in general with	10:03:22

15

1	coding.	10:03:25
2	Q. Okay. Now, if we look to the Ph.D. work	10:03:26
3	that you did, am I correct that your Ph.D. thesis	10:03:36
4	related to the field of turbo codes?	10:03:41
5	A. To some degree. This was not the main	10:03:46
6	focus of my Ph.D., but there were some aspect in my	10:03:49
7	Ph.D. that had to do with turbo code.	10:03:52
8	Q. Okay. Now, in addition to turbo codes,	10:03:55
9	you said there were other aspects; what were those?	10:03:57
10	A. The main aspects had to do with what's	10:03:58
11	multiple-access communication. A simple example of	10:04:02
12	what might -- might be meant with this is if you	10:04:05
13	imagine you have your cell phones and many people	10:04:07
14	are trying to communicate to a common cell phone	10:04:10
15	tower, the question is how do you do this	10:04:13
16	efficiently.	10:04:16
17	Q. And am I correct that one of the ways that	10:04:17
18	you investigated was a turbo code?	10:04:19
19	A. Slightly more specifically, I looked at	10:04:25
20	particular ways, information theoretic ways of how	10:04:28
21	to accomplish that. And when you actually implement	10:04:30
22	such a scheme, there's also coding involved and in	10:04:34
23	that aspect, I apply turbo codes.	10:04:34
24	THE REPORTER: I'm sorry.	10:04:34
25	"And in that aspect" --	10:04:34

1	Repeat that portion, please.	10:04:41
2	THE WITNESS: Right. So in that aspect	10:04:41
3	when you're actually trying to implement that	10:04:44
4	scheme, that involves coding, and for that portion I	10:04:46
5	used turbo codes.	10:04:50
6	BY MR. DOWD:	10:04:51
7	Q. Did you look at any other form of coding?	10:04:52
8	A. I think this was the main form of coding	10:04:55
9	that I used at that time.	10:04:57
10	Q. I see. Have you ever been an expert	10:04:59
11	witness before?	10:05:08
12	A. No.	10:05:09
13	Q. Have you ever been involved in litigation	10:05:09
14	in the United States before?	10:05:11
15	A. No.	10:05:13
16	Q. Welcome.	10:05:17
17	Okay. What is your relationship with	10:05:22
18	Dr. McEliece?	10:05:25
19	MR. GLASS: Objection. Lacks foundation.	10:05:27
20	Go ahead.	10:05:28
21	THE WITNESS: Dr. McEliece is a very, you	10:05:29
22	know, honored colleague. He is someone that, when I	10:05:34
23	was a student, I read his book, a fantastic book. I	10:05:37
24	met him during conferences. I found him to be an	10:05:42
25	extremely original thinker, someone that would	10:05:46

1	typically never -- never, you know, follow simply	10:05:50
2	the pack but would lead, have original ideas, have	10:05:52
3	extremely good presentation skills, and he's one of	10:05:56
4	our most valued luminaries in the field of	10:06:01
5	information theory and coding. Just one example of	10:06:04
6	why that is true is what's called a Shannon awardee.	10:06:07
7	That's the highest honor that is given by the	10:06:11
8	information field society for people working in that	10:06:15
9	field.	10:06:18
10	BY MR. DOWD:	10:06:21
11	Q. So when -- withdrawn.	10:06:21
12	Would you consider Dr. McEliece a friend?	10:06:22
13	A. I did not have many -- you know, not --	10:06:28
14	you know, my contacts were relatively infrequent. I	10:06:31
15	had a few e-mail exchanges with him. I would meet	10:06:37
16	him at, you know, a few conferences, perhaps	10:06:41
17	workshops. The closest contact I ever had with him	10:06:44
18	was about two years when I interviewed him for one	10:06:48
19	of the conferences. This conference takes place	10:06:51
20	every year in San Diego. It's called ITA,	10:06:54
21	information theory and applications.	10:06:59
22	And as part of this conference, there	10:07:00
23	is -- you know, there's a more entertainment section	10:07:03
24	in there, and part of this entertainment section	10:07:07
25	involves interviewing some of our most, you know,	10:07:10

1	well-known people. And I have done this now with a	10:07:14
2	variety of people and Dr. McEliece was one of them.	10:07:17
3	And so there was a segment, perhaps 30	10:07:20
4	minutes long, where we would talk about his life and	10:07:24
5	his accomplishments, but also other aspects of his	10:07:27
6	life that are not necessarily related to, you know,	10:07:30
7	his technical work, simply to show people who he	10:07:33
8	was.	10:07:36
9	Q. Have you ever published a paper together?	10:07:36
10	A. I believe not.	10:07:41
11	Q. Have you ever conducted a research study	10:07:42
12	together?	10:07:45
13	A. No.	10:07:46
14	Q. Have you ever worked for the same	10:07:46
15	employer?	10:07:48
16	A. Certainly not at the same time. I don't	10:07:51
17	know if he ever worked for Bell Labs. Bell Labs	10:07:54
18	is -- I was at Bell Labs. Bell Labs is -- you know,	10:07:56
19	has a long history. He might have at some point	10:07:58
20	been an employee, perhaps, or visited during the	10:08:02
21	summer, not during the time I was there, but I	10:08:05
22	cannot exclude that perhaps at some point in this	10:08:09
23	past he might have had some connections to	10:08:11
24	Bell Labs.	10:08:13
25	Q. And do you have any social relationship	10:08:13

1	with Dr. McEliece?	10:08:16
2	A. No, other than the one time where I	10:08:17
3	interviewed him. I visited him for a couple hours	10:08:19
4	up in -- in Caltech in order to get some material	10:08:22
5	for him, simply some pictures, some other things	10:08:26
6	that I -- that we could discuss. And at that point	10:08:29
7	we talked about some points in, you know, his life,	10:08:32
8	some events that happened. That was the closest I	10:08:33
9	ever interacted with him.	10:08:36
10	Q. Now, you mentioned that that was about two	10:08:37
11	years ago?	10:08:39
12	A. I believe it was exactly two years ago,	10:08:40
13	around February. So I must have visited end of	10:08:43
14	January or something like that.	10:08:46
15	Q. And that would be --	10:08:50
16	THE REPORTER: Wait, wait. One at a time	10:08:50
17	and you need to repeat the last portion of your	10:08:50
18	answer.	10:08:52
19	THE WITNESS: I believe that the -- so it	10:08:52
20	was two years ago, and I believe it would have been	10:08:55
21	towards the end of January.	10:08:59
22	BY MR. DOWD:	10:09:01
23	Q. Of 2013?	10:09:01
24	A. Of 2013, yeah.	10:09:05
25	Q. Not to get into too sensitive of a	10:09:07

1   subject, but I've been informed that his health is   10:09:11

2   impaired at this point; was he in good health at   10:09:13

3   that point?   10:09:17

4   A.   He had some problems. He did well during   10:09:18

5   the interview. But he had some -- you know, he had   10:09:23

6   had some medical issues. I don't know the details   10:09:26

7   of them.   10:09:28

8   Q.   Fair enough. Fair enough.   10:09:29

9   Do you know Dr. Khandekar, who's another   10:09:30

10   named inventor in this case?   10:09:36

11   A.   I might -- I must have met him sometimes   10:09:37

12   during a conference, but I had the least contact   10:09:42

13   with him as -- as far as I know.   10:09:46

14   Q.   Can you recall any specific instance where   10:09:47

15   you met?   10:09:50

16   A.   So we have a yearly conference called   10:09:50

17   International Symposium on Information Theory. It's   10:09:53

18   almost sure that at some point we must've met during   10:09:56

19   this conferences, because essentially this is a   10:10:01

20   conference involving about a thousand people, a   10:10:02

21   thousand participants, and essentially everyone in   10:10:05

22   our field would go to this conference. So it's a   10:10:07

23   virtual certainty that we must've met.

24   THE REPORTER: Hold on. You're going to

25   have to slow down for me; Okay? You're going --

1   THE WITNESS: Okay. Sorry.

2   THE REPORTER: -- too fast. I have a

3   little trouble understanding your accent.

4   THE WITNESS: Okay.

5   THE REPORTER: So I need you just to start

6   the last portion over, slow down.   10:10:22

7   THE WITNESS: So there's a conference   10:10:22

8   called the international -- International Symposium   10:10:26

9   of Information Theory. It takes place every year,   10:10:29

10 typically around June. It involves on the order of 10:10:34

11 a thousand participants. And since almost everyone 10:10:38

12 in the field would attend that conference, it's a   10:10:43

13 virtual certainty that at some point I must have run 10:10:47

14 into him, exchanged a few words. I don't recall the 10:10:51

15 specific instance but I think there's a very good   10:10:55

16 chance that that happened.   10:10:57

17 BY MR. DOWD: 10:10:58

18 Q.   Okay. And you mentioned the International 10:10:59

19 Symposium on Information Theory; are you also   10:11:02

20 familiar with a conference called Ambleside?   10:11:04

21 A.   I -- I've heard the name, although I'm not 10:11:08

22 sure right now where. But I've heard that name   10:11:12

23 before, Ambleside, yes.   10:11:15

24 Q.   Have you ever attended the Ambleside   10:11:16

25 conference?   10:11:19

1	A. I don't think so. If you can tell me	10:11:19
2	exactly where that is -- I -- I've heard the name	10:11:22
3	in -- in -- in the context of our conferences, but I	10:11:24
4	don't believe I've actually been there.	10:11:26
5	Q. You probably know better than me --	10:11:28
6	A. Okay.	10:11:32
7	Q. -- but my understanding is that it's --	10:11:32
8	the -- the -- the location is Ambleside and I	10:11:34
9	believe it's in --	10:11:36
10	A. Yeah.	10:11:36
11	Q. -- the UK.	10:11:37
12	A. Yeah, I don't think I've ever been	10:11:38
13	there --	10:11:40
14	Q. Okay.	10:11:40
15	A. -- in Ambleside, yeah.	10:11:40
16	Q. How about the Allerton conference; are you	10:11:42
17	familiar with that conference?	10:11:45
18	A. Yes, I'm familiar with that conference.	10:11:46
19	Q. What is the Allerton conference?	10:11:48
20	A. The Allerton conference is another yearly	10:11:50
21	conference. It typically takes place around end of	10:11:53
22	September or beginning of October. It's a	10:11:57
23	conference that has a focus topics in communications	10:12:01
24	and control. Although lately the topics have	10:12:04
25	shifted a little bit.	10:12:12

23

1	And so it's a yearly conference that is	10:12:12
2	mostly visited by invitation; most of the people	10:12:15
3	there go by invitation.	10:12:18
4	Q. And what sorts of folks attend?	10:12:20
5	A. Mostly from academia. There are special	10:12:23
6	sessions that are organized, and depending on the	10:12:26
7	topic, certain people are invited. And it's	10:12:29
8	organized by faculty, typically from UIUC, from the	10:12:33
9	University of Illinois, Urbana-Champaign.	10:12:44
10	Q. Have you attended?	10:12:44
11	A. Yes.	10:12:46
12	Q. When?	10:12:46
13	A. Perhaps the first time might have been in	10:12:47
14	1992, perhaps. I'm not 100 percent sure. I -- I	10:12:50
15	went to Washington University, which is not very far	10:12:54
16	away, and I started in 1990 at Wash U, so perhaps I	10:13:00
17	probably didn't go the first year, perhaps not the	10:13:06
18	second year, but it's a fair guess that around 1992	10:13:09
19	I started going to this conference.	10:13:12
20	Q. Okay. And -- and have been every year	10:13:14
21	ever since or --	10:13:16
22	A. No. I went for a few years in a row, and	10:13:17
23	then I haven't been now in quite a few years. But	10:13:21
24	I've gone there for perhaps a total of 10 years,	10:13:29
25	perhaps.	10:13:32

1	Q.	Okay. So the key kind of time frame here	10:13:33
2	is about 1997 to about 2000. Did you attend in		10:13:36
3	those -- those years?		10:13:41
4	A.	I -- I can't be for sure. There's a	10:13:46
5	chance that I attended some of these conferences,		10:13:48
6	but I don't know for sure. I would have to check.		10:13:50
7	Q.	Is there any during that period that you	10:13:52
8	recall that you did attend?		10:13:56
9	A.	Not specifically.	10:13:57
10	Q.	All right. You mentioned the IEEE	10:13:58
11	earlier; is there an IEEE transactions on		10:14:09
12	communications?		10:14:12
13	A.	Yes.	10:14:12
14	Q.	What is that conference about?	10:14:13
15	A.	Oh, that's -- I thought you're referring	10:14:16
16	to a journal.		10:14:19
17	Q.	Ah, pardon me.	10:14:20
18	A.	Okay.	10:14:22
19	Q.	Is there an IEEE-sponsored conference in	10:14:22
20	this field?		10:14:26
21	A.	So the transaction of -- sorry, the	10:14:26
22	IEEE -- International Symposium on Information		10:14:31
23	Theory is sponsored by IEEE.		10:14:34
24	Q.	Pardon me.	10:14:37
25	A.	So is the -- is ITA, and I believe that so	10:14:37

1	is now the Allerton conference, although I believe	10:14:42
2	that this is only very recently so that the Allerton	10:14:48
3	conference is associated to IEEE. I believe that	10:14:51
4	this might only be the last, perhaps, five, six	10:14:54
5	years or so.	10:14:58
6	Q. Uh-huh. And as you move from conference	10:14:59
7	to conference, International Symposium on	10:15:02
8	Information Theory, the Allerton conference, the ITA	10:15:07
9	conference, I think we also mentioned Ambleside, is	10:15:10
10	it generally the same folks attending these	10:15:14
11	conferences?	10:15:17
12	MR. GLASS: Objection. Vague. Lacks	10:15:18
13	foundation.	10:15:20
14	THE WITNESS: There's some overlap of	10:15:20
15	people, but they're also distinct people that would	10:15:24
16	only go to some of these conferences.	10:15:28
17	BY MR. DOWD:	10:15:31
18	Q. Okay. But you would see some of the same	10:15:32
19	people over and over again at these different	10:15:34
20	conferences?	10:15:37
21	MR. GLASS: Same objections.	10:15:37
22	THE WITNESS: Some of them; some of	10:15:38
23	these -- some of these people might be at various	10:15:39
24	conferences.	10:15:42
25	///	

1	BY MR. DOWD:	10:15:42
2	Q. Okay. Let's return to the inventors.	10:15:42
3	The third named inventor on the patents	10:15:48
4	that we're dealing with is a Dr. Jin; do you know	10:15:50
5	Dr. Jin?	10:15:54
6	A. I must've also met him at some of these	10:15:55
7	conferences.	10:16:00
8	Q. Do you have a personal relationship with	10:16:01
9	him?	10:16:02
10	A. No.	10:16:03
11	Q. Do you recall any specific instance where	10:16:03
12	you've met him?	10:16:05
13	A. I'm afraid not any particular date and	10:16:06
14	time. But I'm sure I must've met him, I must've	10:16:09
15	talked to him at some point, not extensively --	10:16:14
16	Q. Uh-huh.	10:16:14
17	A. -- and I might have had an occasional	10:16:18
18	e-mail exchange at some point, but various -- you	10:16:20
19	know, perhaps a few. But I don't recall any	10:16:22
20	particular e-mail exchange or any particular time	10:16:24
21	that I met him.	10:16:26
22	Q. Got it. Let's turn to the preparation for	10:16:27
23	the deposition.	10:16:32
24	What did you do to prepare for the	10:16:32
25	deposition today?	10:16:34

27

1	MR. GLASS: As phrased I'm going to object	10:16:35
2	to that question. It calls for -- potentially	10:16:37
3	calling for attorney-client privileged information	10:16:39
4	and instruct the witness not to answer.	10:16:42
5	THE WITNESS: Could you just please repeat	10:16:44
6	the question?	10:16:45
7	BY MR. DOWD:	10:16:45
8	Q. Sure. What did you do to prepare for your	10:16:46
9	deposition today?	10:16:48
10	MR. GLASS: And the same objection as	10:16:49
11	phrased and instruct the witness not to answer.	10:16:51
12	MR. DOWD: Are you going to follow that	10:16:52
13	instruction?	10:16:54
14	THE WITNESS: Yes.	10:16:54
15	MR. DOWD: That's an improper instruction.	10:16:55
16	MR. GLASS: I think as phrased, that	10:16:57
17	question is overbroad. We both know the boundaries	10:16:58
18	of the question, so...	10:17:02
19	MR. DOWD: I'm not going to waste time	10:17:02
20	debating it with you.	10:17:04
21	MR. GLASS: Sure.	10:17:05
22	MR. DOWD: To the extent you continue to	10:17:06
23	make improper instructions, we'll raise it with the	10:17:08
24	judge.	10:17:11
25	MR. GLASS: That instruction was not	10:17:12

28

1	improper, but I agree let's not waste time.	10:17:13
2	MR. DOWD: There's not supposed to be	10:17:13
3	speaking objections here.	10:17:15
4	BY MR. DOWD:	10:17:15
5	Q. Now, Dr. Urbanke, did you prepare for your	10:17:18
6	deposition today?	10:17:20
7	A. I wrote this expert report.	10:17:20
8	Q. Okay. Other than writing the expert	10:17:23
9	report, without getting into any details, did you do	10:17:26
10	anything else?	10:17:29
11	A. Nothing specific.	10:17:29
12	Q. Okay. In advance of coming to the	10:17:31
13	deposition today, did you meet with counsel; "yes"	10:17:33
14	or "no"?	10:17:36
15	A. In advance to meet -- I met with counsel	10:17:36
16	several times also preparing for the report.	10:17:39
17	Q. Okay. So let's talk first about the --	10:17:42
18	the preparation of the -- preparation for the	10:17:45
19	deposition, okay?	10:17:47
20	When did you first meet to prepare for the	10:17:50
21	deposition?	10:17:53
22	A. There was no specific time to prepare for	10:17:54
23	this thing. This is a continuation of writing my	10:17:58
24	report. I'm simply making sure that, you know,	10:18:00
25	everything is in order, that I know all the facts.	10:18:03

1	Q. Okay. You have a document in front of	10:18:06
2	you; is that your report?	10:18:08
3	A. Yes.	10:18:09
4	Q. Can you hand over whatever you have there?	10:18:10
5	A. (Witness complied.)	10:18:12
6	Q. Actually, why don't you hand over the full	10:18:13
7	stack. Great. Thanks.	10:18:16
8	So who selected the documents that you	10:18:52
9	have in front of you?	10:18:54
10	A. These are documents that are deemed	10:18:55
11	important -- I deem important for, you know, the	10:18:58
12	preparation for today.	10:19:01
13	Q. Okay. The last document in the stack is a	10:19:03
14	paper by Dr. MacKay; do you see that?	10:19:06
15	A. Yes, I see that.	10:19:11
16	Q. Who is Dr. MacKay?	10:19:12
17	A. Dr. MacKay is originally a physicist in	10:19:14
18	the area of statistic physics. I believe he has	10:19:18
19	some connections to Bob McEliece. Perhaps he was	10:19:21
20	his student or he was his post doc. I don't know.	10:19:25
21	Q. Uh-huh.	10:19:25
22	A. And for some point in time, he got	10:19:28
23	interested in error code decoding. He wrote -- he	10:19:30
24	wrote some papers on it. He then got out and is now	10:19:33
25	in a different area. And he's, you know, located in	10:19:38

1	Great Britain.	10:19:41
2	Q. Okay. Just because I don't remember the	10:19:43
3	title from -- by heart, what was the title of the	10:19:45
4	paper that you have there?	10:19:47
5	A. This paper is entitled:	10:19:54
6	"Comparison of Constructions of	10:19:56
7	Irregular Gallagher Codes."	10:19:58
8	Q. Why did you select that paper to bring	10:20:00
9	with you today?	10:20:03
10	A. It's, you know, one paper that deals with	10:20:04
11	the general area that we're talking about.	10:20:07
12	Q. Okay. So MacKay worked in the area that	10:20:10
13	relates to this case?	10:20:13
14	A. Yes.	10:20:16
15	MR. DOWD: Let's mark as Exhibit 2 a copy	10:20:16
16	of your report. Feel free to use either the exhibit	10:20:19
17	version or your own version.	10:20:23
18	(Urbanke Exhibit 2 was marked for	10:20:26
19	identification and attached to the	10:20:26
20	transcript.)	10:20:51
21	BY MR. DOWD:	10:20:51
22	Q. Do you recognize Exhibit 2?	10:20:52
23	A. Yes.	10:20:53
24	Q. What is it?	10:20:53
25	A. It's my expert report.	10:20:54

1	Q. Now, when were you first engaged for this	10:20:56
2	case?	10:21:00
3	A. I believe it must have been January,	10:21:01
4	sometime in January.	10:21:07
5	Q. Of 2015?	10:21:08
6	A. Yes.	10:21:09
7	Q. And how were you contacted?	10:21:10
8	A. I was contacted by an attorney. His name	10:21:14
9	is Mark Tung who asked me to -- if I	10:21:19
10	was --	10:21:24
11	MR. GLASS: I'm going to caution the	10:21:24
12	witness not to divulge any communications between	10:21:26
13	you and counsel.	10:21:28
14	BY MR. DOWD:	10:21:30
15	Q. Well, let me ask, when in January did	10:21:30
16	Mr. Tong contact you?	10:21:33
17	A. I don't recall the exact date.	10:21:34
18	Q. Was it around New Year's or was it around	10:21:36
19	the end of the month?	10:21:39
20	A. It was earlier.	10:21:41
21	Q. Okay. Now, did Mr. Tong provide to you	10:21:44
22	any facts that you've relied on in the course of	10:21:52
23	reaching the opinions expressed in Exhibit 2?	10:21:55
24	A. No.	10:22:00
25	Q. What were you asked to do?	10:22:00

1	A. So the general question that was posed to	10:22:09
2	me is what is stated in my report. I was asked to	10:22:11
3	give a general opinion about the state-of-the-art	10:22:16
4	and to give some opinions relating to a paper that	10:22:20
5	I'm a co-author with. It's Richardson, et al.	10:22:24
6	And also I added some opinions that have	10:22:28
7	to do with the Luby '79 and the Luby '98 papers.	10:22:32
8	Q. Is that Luby '97?	10:22:38
9	A. Sorry, what did I say? Yeah, sorry. '97	10:22:39
10	and '98, yeah.	10:22:42
11	Q. And if I refer to the Richardson paper	10:22:44
12	that you're a co-author on as Richardson '99, will	10:22:47
13	that make sense?	10:22:52
14	A. Correct.	10:22:53
15	Q. Okay. Now, how long did you spend working	10:22:55
16	on the case between the time that you were	10:22:58
17	originally contacted and the time that the report	10:23:01
18	was produced on February 17th?	10:23:03
19	A. I don't have the exact hours, but I would	10:23:05
20	guess that, perhaps, it took me on the order of	10:23:09
21	maybe 50 hours or something like that. But that's a	10:23:13
22	rough estimate. I don't have the exact, you know,	10:23:16
23	number; I have not tallied up the number.	10:23:18
24	Q. Okay. Who wrote the report?	10:23:22
25	A. I didn't type every single word, but this	10:23:23

1	is my report. I wrote this report.	10:23:26
2	Q. Okay. Who typed it?	10:23:28
3	A. Various parts were, you know, typed up.	10:23:30
4	Q. Okay. Did you receive any portion of this	10:23:35
5	already written?	10:23:39
6	A. No. Well, this is my -- this is my --	10:23:41
7	it's my opinion, my work, and this is my -- my	10:23:44
8	things. But I didn't type everything up myself.	10:23:47
9	Q. Okay. You understand that there are also	10:23:50
10	reports from a Dr. Shokrollahi and a Dr. Divsalar in	10:23:52
11	this case?	10:23:59
12	A. I've heard names mentioned, but I have no	10:23:59
13	particular knowledge about, you know, who -- who	10:24:02
14	is -- might be other experts or something like that.	10:24:04
15	I've heard some names mentioned, but that's it.	10:24:07
16	Q. If paragraphs of your report are	10:24:10
17	word-for-word identical to the paragraphs in	10:24:13
18	Dr. Shokrollahi or Dr. Divsalar's report, can you	10:24:15
19	explain how that happened?	10:24:18
20	MR. GLASS: Objection. Vague. Lacks	10:24:19
21	foundation.	10:24:23
22	THE WITNESS: If you could point out a	10:24:23
23	particular paragraph that might have the	10:24:25
24	characteristic.	10:24:27
25	///	

1	BY MR. DOWD:	10:24:28
2	Q. Sure. I will. I'll come back to that.	10:24:29
3	Let me look at Paragraph 5 with you for a	10:24:31
4	second.	10:24:35
5	A. Sure.	10:24:36
6	Q. It's on educational background?	10:24:37
7	Do you see in the second line it starts	10:24:43
8	talking about time frequency transform?	10:24:50
9	A. Yes.	10:24:50
10	Q. Is that just an error?	10:24:53
11	THE REPORTER: Wait. Hold on. Hold on.	
12	"Do you see in the second line" --	
13	Start there and slow down.	
14	Q. It starts talking about time frequency	
15	transform. Is that just an error?	
16	A. Yeah, that's an error.	10:24:55
17	Q. Okay. Are you aware of any other errors	10:24:57
18	in the report?	10:25:00
19	A. I don't think anything grave. I think,	10:25:00
20	you know, University of Vienna should technically be	10:25:04
21	University Vienna, I missed that word. But there's	10:25:07
22	only one university in Vienna, so there's no	10:25:11
23	possible cause of confusion.	10:25:16
24	Q. Okay. After -- I guess between your	10:25:20
25	retention in January and the date of the report,	10:25:24

1	February 17th, how many times did you meet with	10:25:28
2	counsel?	10:25:31
3	A. "Meet" means exactly what?	10:25:36
4	Q. Meeting in person.	10:25:38
5	A. Between -- what was the time frame, again,	10:25:41
6	I'm sorry?	10:25:44
7	Q. When you were retained for the case and	10:25:45
8	the February 17th date on your report?	10:25:47
9	A. I believe once.	10:25:49
10	Q. Where was that meeting?	10:25:50
11	A. In San Francisco.	10:25:52
12	Q. When did that take place?	10:25:54
13	A. When exactly was that? Today was the	10:26:04
14	25th. Perhaps two weeks ago.	10:26:07
15	Q. Okay.	10:26:14
16	A. Perhaps a little bit more, yeah.	10:26:14
17	Q. How long was the meeting?	10:26:16
18	A. I would say, perhaps, two or three hours	10:26:19
19	or something on this order.	10:26:29
20	Q. And what was the purpose?	10:26:31
21	A. In general to get some legal counsel. I'm	10:26:35
22	not a lawyer.	10:26:38
23	Q. Okay. Did it relate to any of the	10:26:44
24	opinions that are stated in your report?	10:26:52
25	A. No.	10:26:54

1	Q. Okay. At any time between when you were	10:26:54
2	retained and when you signed your report on	10:26:56
3	February 17th, were you provided with any facts that	10:26:59
4	you were asked to assume for the purpose of this	10:27:02
5	case?	10:27:05
6	A. No.	10:27:05
7	Q. If we'd turn to the last page, Page 36,	10:27:05
8	that is your signature?	10:27:09
9	A. Yes.	10:27:10
10	Q. Okay. Now, I take it you've been retained	10:27:14
11	by Caltech for the case; is that correct?	10:27:19
12	A. I'm not sure I understand exactly. Can	10:27:22
13	you tell me what that means, "retained by	10:27:26
14	Caltech," --	10:27:27
15	Q. Who --	10:27:27
16	A. -- as opposed -- as opposed to who else	10:27:28
17	would -- I'm not sure exactly what, you know -- what	10:27:30
18	exactly means "retained" here.	10:27:35
19	Q. Well, I don't know the facts of how you	10:27:37
20	came to be retained, so if you could just tell me	10:27:40
21	who retained you, that's what I'm after.	10:27:43
22	A. I -- as I mentioned, I was contacted to be	10:27:46
23	an expert witness in this case.	10:27:48
24	Q. Okay. Did you sign any form of engagement	10:27:50
25	letter?	10:27:54

1	A.	No.	10:27:54
2	Q.	Did you sign any form of agreement?	10:27:54
3	A.	No.	10:27:57
4	Q.	Are you receiving any form of compensation	10:27:57
5		for your opinions?	10:28:00
6	A.	Yes, as stated in my expert report, I	10:28:01
7		receive a compensation that is based on an hourly	10:28:05
8		charge.	10:28:08
9	Q.	Okay. So how much are you being paid for	10:28:09
10		the opinions in your report?	10:28:12
11	A.	I'm being paid $500 per hour.	10:28:13
12	Q.	Now, you understand the case involves four	10:28:18
13		patents?	10:28:22
14	A.	Yes.	10:28:22
15	Q.	And if I refer to them as the '710, the	10:28:26
16		'032, the '781, and the '833 patents, does that make	10:28:31
17		sense to you?	10:28:36
18	A.	Yes.	10:28:37
19	Q.	Okay. Before being retained by -- for	10:28:39
20		this case -- well, just because it's going to bug	10:28:41
21		me, so you don't know whether you were retained by	10:28:45
22		Caltech or by the law firm that represents Caltech;	10:28:48
23		is that the issue?	10:28:51
24	A.	Yes.	10:28:52
25	Q.	All right. Before you were retained, had	10:28:53

1	you ever seen the '710 patent?	10:28:56
2	A. I don't believe so.	10:28:58
3	Q. Had you ever seen the '032 patent?	10:29:00
4	A. I don't believe so.	10:29:03
5	Q. How about the '781?	10:29:04
6	A. I don't believe so.	10:29:06
7	Q. How about the '833?	10:29:06
8	A. I don't believe so.	10:29:09
9	Q. Have you ever read any of these patents	10:29:10
10	before you were retained?	10:29:12
11	A. I don't believe so.	10:29:13
12	Q. Okay. When is the first time that you	10:29:14
13	heard of these patents?	10:29:20
14	A. When I reviewed the case history, that's	10:29:22
15	when, you know, I heard about these particular	10:29:24
16	patents.	10:29:27
17	Q. Okay. And that was sometime in January?	10:29:27
18	A. January throughout -- yes, January and	10:29:29
19	then February -- extending to February until the	10:29:32
20	report was written, yes.	10:29:35
21	Q. Okay. Of this year?	10:29:36
22	A. Yes.	10:29:38
23	Q. Okay. Have you analyzed the claims of the	10:29:38
24	'710 patent?	10:29:50
25	A. No.	10:29:51

1	Q.	How about the '032?	10:29:52
2	A.	No.	10:29:53
3	Q.	'781?	10:29:53
4	A.	No.	10:29:55
5	Q.	'833?	10:29:55
6	A.	No.	10:29:59
7	Q.	I -- I noticed when I was reading the	10:29:59
8		report, there's no opinion that compares any	10:30:02
9		specific prior art reference to any claim	10:30:06
10		limitation; is that correct?	10:30:11
11	A.	That's correct.	10:30:12
12	Q.	Okay. So you -- you've not attempted to	10:30:12
13		determine whether any reference or combination of	10:30:14
14		references discloses the limitations of one of the	10:30:17
15		asserted claims?	10:30:24
16	A.	I have been asked to comment on the report	10:30:25
17		of Dr. Frey, and so my response was my expertise was	10:30:27
18		in response to what was written by Dr. Frey, but not	10:30:33
19		specifically to the claims of the patent.	10:30:36
20	Q.	Okay. And -- and -- and just so there's	10:30:38
21		no mystery about it, part of the processes, so that	10:30:39
22		I can understand what are the right areas to ask you	10:30:43
23		and what are the wrong areas to ask you --	10:30:46
24	A.	Right.	10:30:48
25	Q.	-- and I just want to confirm that you	10:30:48

1	have not formed any opinion about whether the	10:30:51
2	Divsalar reference, for example, the Luby '97,	10:30:54
3	Luby '98, Richardson '99, Frey '99, you've not	10:30:59
4	formed any opinion about whether those specific	10:31:04
5	references disclose the specific limitations of any	10:31:06
6	claim that's asserted in this case?	10:31:09
7	A. No.	10:31:11
8	Q. Okay. When is the first time you heard	10:31:13
9	the term "IRA code"?	10:31:15
10	MR. GLASS: Lacks foundation.	10:31:18
11	MR. DOWD: I hope not.	10:31:24
12	THE WITNESS: Sorry?	10:31:26
13	MR. DOWD: I said: "I hope not."	10:31:27
14	THE WITNESS: I didn't understand.	10:31:31
15	MR. GLASS: You can go ahead and answer	10:31:31
16	the question.	10:31:33
17	THE WITNESS: Okay.	10:31:34
18	BY MR. DOWD:	10:31:34
19	Q. Let me ask the question again. I was just	10:31:34
20	being funny. Your counsel said that it lacks	10:31:37
21	foundation which would suggest that you never heard	
22	the term "IRA code," which would be a funny thing if	
23	you're giving testimony about IRA codes.	
24	THE REPORTER: Sir --	
25	MR. DOWD: You don't have to take it down.	

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1   THE REPORTER: Yeah, this is being

2   videotaped and I've got to take a clear record, so I

3   just need you to slow down; okay?

4   MR. DOWD. Yeah, fair enough.

5   THE REPORTER: Thank you.

6   MR. DOWD: I'll just reask the question.

7   THE REPORTER: I appreciate that.

8   MR. DOWD: I'll just reask the question.   10:31:51

9   THE REPORTER: Go ahead.   10:31:52

10   BY MR. DOWD: 10:31:52

11   Q.   So the question was, when is the first   10:31:54

12   time you heard the term "IRA codes"?   10:31:56

13   A.   I can't assert with certainty when exactly 10:31:59

14   I heard it, but it must have been -- or, you know,   10:32:03

15   there was a conference at the International   10:32:07

16   Symposium on Information Theory, for example, in   10:32:10

17   probably June or July 2000, certainly there I   10:32:13

18   must've heard about it. Whether or not I heard   10:32:17

19   about it slightly prior to it, I don't know.   10:32:20

20   Q.   Okay. So the first concrete time that you 10:32:23

21   can recall is a conference in June/July 2000?   10:32:25

22   A.   I don't actually recall the event, but   10:32:28

23   since I was there at the conference and I do   10:32:31

24   remember that, you know, there was some excitement   10:32:33

25   about those codes, it must have been at that point   10:32:35

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1	in time that, you know, that happened. That's the	10:32:39
2	most logical explanation.	10:32:41
3	Q. All right. IRA codes, the I, the R, the A	10:32:44
4	it's an acronym, right?	10:32:48
5	A. Exactly.	10:32:49
6	Q. What does I stand for?	10:32:50
7	A. Irregular.	10:32:59
8	Q. What does R stand for?	10:33:00
9	A. Repeat.	10:33:01
10	THE REPORTER: Wait. Slow down. You guys	10:33:01
11	are going to have to just slow down. Start with.	10:33:01
12	"What does I stand for" --	10:33:01
13	THE WITNESS: Irregular.	10:32:59
14	BY MR. DOWD:	10:33:00
15	Q. What does R stand for?	10:33:00
16	A. Repeat.	10:33:01
17	Q. And what does A stand for?	10:33:02
18	A. Accumulate.	10:33:04
19	MR. DOWD: Why don't we mark as Exhibit 3	10:33:12
20	a copy of the '781 patent just for reference.	10:33:17
21	(Urbanke Exhibit 3 was marked for	10:33:21
22	identification and attached to the	10:33:21
23	transcript.)	10:33:44
24	BY MR. DOWD:	10:33:44
25	Q. Do you have Exhibit 3?	10:33:45

1	A. Yes, I do.	10:33:46
2	Q. Have you seen it before?	10:33:47
3	A. Yes.	10:33:49
4	Q. What is it?	10:33:49
5	MR. GLASS: Objection. Vague.	10:33:51
6	THE WITNESS: Let me just check here,	10:34:16
7	sorry. So this is the third one in a continuation	10:34:18
8	of patents, the third out of the four patents that	10:34:45
9	were filed by these three inventors.	10:34:48
10	BY MR. DOWD:	10:34:53
11	Q. Okay. So is this a copy of the '781	10:34:53
12	patent?	10:34:58
13	A. Sorry, are you asking me if that's a copy?	10:34:58
14	Q. Yes. Exhibit 3 is a copy of the '781	10:35:02
15	patent?	10:35:06
16	A. Yes, I believe so.	10:35:06
17	Q. Okay. Now, if you turn to the last page,	10:35:07
18	which has on the bottom the page number ending in	10:35:10
19	3 -- 6351, you see there are claims that are recited	10:35:14
20	there?	10:35:21
21	A. Yes.	10:35:21
22	Q. Have you read these claims before?	10:35:21
23	A. I very quickly skimmed through them simply	10:35:24
24	for the purpose of determining that they relate to	10:35:27
25	IRA codes, but I didn't examine these claims in any	10:35:30

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1	detail.	10:35:33
2	Q. Okay. Do you understand what a claim	10:35:33
3	limitation is?	10:35:36
4	A. I have a very vague understanding of what	10:35:37
5	it is.	10:35:40
6	Q. What is your understanding?	10:35:40
7	A. Sorry, what the -- what the limitations in	10:35:45
8	general -- the claims in general are? That's what	10:35:48
9	the question is?	10:35:48
10	THE REPORTER: I'm sorry.	10:35:48
11	THE WITNESS: Okay.	10:35:48
12	THE REPORTER: I didn't catch that.	10:35:48
13	You're going to have to repeat yourself, please.	10:35:54
14	THE WITNESS: Okay. Sorry, perhaps I	10:35:54
15	didn't understand the previous question exactly.	10:35:55
16	Okay.	10:35:57
17	BY MR. DOWD:	10:35:57
18	Q. What is your understanding of what a claim	10:35:57
19	limitation is, generally?	10:36:00
20	A. I understand what -- the very basic idea	10:36:03
21	of what claims are, what the limitations in	10:36:07
22	particular are. If that refers to something	10:36:10
23	different than the claims, I'm not sure I	10:36:12
24	understand.	10:36:13
25	Q. Okay. Let me -- let me see if I can	10:36:13

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1	approach it a different way.	10:36:15
2	If you focus on the right column, there's	10:36:17
3	a Claim 19?	10:36:20
4	A. Yes.	10:36:22
5	Q. Do you understand that it's the words that	10:36:24
6	are recited in Claim 19 that define the right of the	10:36:27
7	patent?	10:36:31
8	A. Yes.	10:36:33
9	MR. GLASS: Objection. Vague. Calls for	10:36:34
10	a legal conclusion.	10:36:35
11	BY MR. DOWD:	10:36:35
12	Q. Okay. So when I'm referring to the	10:36:36
13	"limitations of the claim," I'm referring to the	10:36:38
14	words that are used.	10:36:40
15	A. The elements.	10:36:41
16	Q. Right. And do you understand that unless	10:36:42
17	something's recited by the claim, it's not required	10:36:45
18	by the claim?	10:36:48
19	A. Okay. I wasn't aware of that particular	10:36:53
20	limitation.	10:36:57
21	Q. Okay. So in -- in performing the analysis	10:36:58
22	reflected in your report, you were not aware that	10:37:01
23	it's the limitations of the claim that define the	10:37:07
24	rights?	10:37:10
25	MR. GLASS: Objection. Mischaracterizes	10:37:10

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1	testimony.	10:37:12
2	THE WITNESS: I did not do a patent -- I	10:37:12
3	did not -- I did not do a claim investigation or a	10:37:15
4	claim thing. The only reason I looked at these	10:37:19
5	claims was to determine that in general they refer	10:37:22
6	to IRA codes. That's the extent to which I looked	10:37:25
7	at the claims.	10:37:29
8	BY MR. DOWD:	10:37:30
9	Q. Okay. But you do know that if the claim	10:37:31
10	doesn't require -- withdrawn.	10:37:37
11	If the claim doesn't recite a requirement,	10:37:39
12	then the claim doesn't require that requirement,	10:37:43
13	right?	10:37:47
14	A. Might very well be so. I'm not a lawyer;	10:37:47
15	I don't know.	10:37:50
16	Q. You can't answer that one way or the	10:37:51
17	other?	10:37:53
18	A. If you say so, I trust you that that's	10:37:53
19	true but --	10:37:56
20	Q. Okay.	10:37:56
21	A. -- I'm not a lawyer.	10:37:56
22	Q. Let's just focus on Claim 19, for example.	10:37:58
23	There's no reference in Claim 19 to the	10:38:05
24	Shannon limit, right?	10:38:09
25	MR. GLASS: Objection. Calls for a legal	10:38:17

1 conclusion.   10:38:18

2   THE WITNESS: There's not the word   10:38:18

3 "Shannon" in there directly, but that doesn't   10:38:19

4 necessarily mean it doesn't reference it in some   10:38:22

5 indirect way. I have not investigated that with   10:38:24

6 respect to this aspect, so I don't know.   10:38:28

7 BY MR. DOWD: 10:38:30

8   Q.   Okay. So you have no opinion about   10:38:30

9 whether Claim 19 requires performance within some   10:38:32

10 percentage of the Shannon limit, correct?   10:38:35

11   A.   I have not done this analysis. I don't   10:38:38

12 know.   10:38:41

13   Q.   All right. And that's true for all claims   10:38:41

14 that are asserted in this case?   10:38:43

15   A.   Yes, I have not looked at the claims with   10:38:44

16 respect to a particular question.   10:38:47

17   Q.   You see Claim 19 also does not recite any   10:38:49

18 encoding or decoding that -- that it has to be in   10:38:53

19 linear time as opposed to something else, right?   10:38:58

20   MR. GLASS: Objection. Calls for a legal   10:39:01

21 conclusion.   10:39:02

22   THE WITNESS: Might be. As -- as I said,   10:39:02

23 I've -- I've not been asked to do that analysis, and   10:39:05

24 so I have not done it. I don't know.   10:39:08

25 ///

1	BY MR. DOWD:	10:39:10
2	Q. Okay. So you have no opinion about --	10:39:10
3	withdrawn.	10:39:10
4	So you have formed no opinion that	10:39:15
5	Claim 19 or any other claim asserted in this case	10:39:18
6	requires encoding or decoding in linear time?	10:39:22
7	A. No, I have not done this analysis.	10:39:25
8	Q. All right. Now, Claim 19 also doesn't	10:39:28
9	recite anything about complexity, a minimum	10:39:35
10	complexity, does it?	10:39:41
11	MR. GLASS: Calls for a legal conclusion.	10:39:42
12	THE WITNESS: Same -- same answer as	10:39:43
13	before. It might very well be, but I have not	10:39:44
14	looked at that.	10:39:47
15	BY MR. DOWD:	10:39:48
16	Q. Okay. So you have no opinion about	10:39:48
17	whether any claim at issue in this case has a	10:39:50
18	minimum complexity requirement?	10:39:53
19	A. No.	10:39:54
20	Q. Okay. Let's turn back to your report for	10:40:08
21	a second, and if we could go to Paragraph 82,	10:40:11
22	please. Just let me know when you have that.	10:40:15
23	A. Yes, I have I found the paragraph.	10:40:35
24	Q. And that paragraph begins:	10:40:37
25	"As the paper by Dr. McEliece and his	10:40:39

1	teammates demonstrates, inventing" --	10:40:47
2	THE REPORTER: Wait. I'm sorry, slow	
3	down.	
4	"As the"?	
5	BY MR. DOWD:	
6	Q. -- "paper by Dr. McEliece and his	
7	teammates demonstrates, inventing IRA	10:40:50
8	codes consisted of more than," --	10:40:50
9	And then it continues; do you see that?	10:40:52
10	A. Right.	10:40:54
11	Q. What paper are you talking about?	10:40:55
12	A. I referred to the paper that irregular IRA	10:40:58
13	codes -- one version of this -- a short version of	10:41:05
14	this paper was -- was published or was represented	10:41:10
15	at the -- the International Symposium of Information	10:41:14
16	Theory.	10:41:22
17	MR. DOWD: Let's mark as Exhibit 4, I	10:41:22
18	believe, a copy of the Exhibit B from your report,	10:41:30
19	the list of materials considered.	10:41:33
20	(Urbanke Exhibit 4 was marked for	10:41:35
21	identification and attached to the	10:41:35
22	transcript.)	10:41:59
23	BY MR. DOWD:	10:41:59
24	Q. Do you have Exhibit 4?	10:41:59
25	A. Yes, I have Exhibit 4.	10:42:00

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1	Q. And this is the list of materials that you	10:42:02
2	considered in forming the opinions in your report in	10:42:05
3	the case; is that correct?	10:42:08
4	A. Yes.	10:42:09
5	Q. Can you identify which paper you're	10:42:09
6	talking about in Paragraph 82?	10:42:13
7	A. It must be the second International	10:42:23
8	Symposium on Turbo Codes and Related Topics.	10:42:25
9	Q. Is that the one that begins:	10:42:31
10	"Jin et al., irregular	10:42:34
11	repeat-accumulate codes"?	10:42:35
12	A. Yes.	10:42:38
13	Q. Six from the bottom?	10:42:38
14	A. Yes.	10:42:41
15	MR. DOWD: Let's mark as a copy of	10:42:44
16	Exhibit 5 the Jin et al., IRA codes paper.	10:42:46
17	(Urbanke Exhibit 5 was marked for	10:42:52
18	identification and attached to the	10:42:52
19	transcript.)	10:43:18
20	BY MR. DOWD:	10:43:18
21	Q. Do you have Exhibit 5?	10:43:19
22	A. Let me just check that that's the same.	10:43:28
23	Yes, I do.	10:43:35
24	Q. Okay. And is Exhibit 5 a copy of the Jin	10:43:35
25	et al., IRA codes paper that you're referring to in	10:43:40

1	Paragraph 82?	10:43:43
2	A. Yes.	10:43:44
3	Q. Okay. Now, when you were performing your	10:43:45
4	analysis, did you use the Jin et al., IRA codes	10:43:49
5	paper?	10:43:53
6	A. I looked at that paper, yes.	10:43:54
7	Q. And in performing your analysis, you	10:43:58
8	compared the prior art references that we discussed	10:44:01
9	earlier, the Luby '97 and '98, the Richardson '99,	10:44:06
10	and the other references to IRA codes; do you recall	10:44:09
11	that?	10:44:13
12	A. Yes.	10:44:13
13	Q. When you performed this analysis, were the	10:44:17
14	IRA codes that you had in mind the codes in the	10:44:21
15	paper that we marked as Exhibit 5?	10:44:23
16	A. IRA codes have various representation;	10:44:29
17	this is one particular representation of these	10:44:31
18	codes.	10:44:33
19	Q. Okay. And so my question is, when you	10:44:33
20	performed the comparison of the prior art to IRA	10:44:36
21	codes, were the IRA codes that you had in mind the	10:44:39
22	ones from Exhibit 5?	10:44:42
23	A. I had in mind in general application of	10:44:45
24	IRA codes. There are various ways of representing	10:44:49
25	them. And so my understanding for IRA codes applies	10:44:52

1	to the general way of thinking of IRA codes.	10:44:55
2	Q. Okay. And so that would include the IRA	10:44:59
3	codes in Exhibit 5; is that right?	10:45:02
4	A. That is one particular way of representing	10:45:04
5	IRA codes.	10:45:06
6	Q. All right.	10:45:07
7	Okay. Let's turn to Paragraph 57 in your	10:45:56
8	report. And you begin a discussion there of a	10:45:59
9	repeat-accumulate codes; do you have that in mind?	10:46:10
10	A. You said Paragraph 58 or 57, sir?	10:46:12
11	Q. If I misspoke, I apologize; I meant 51.	10:46:15
12	A. You're talking about the one product of	10:46:26
13	the research, trying to analyze?	10:46:28
14	Q. Yes. So there's a discussion from	10:46:31
15	Paragraph 51 through about 58 of RA codes, right?	10:46:35
16	A. Yes.	10:46:42
17	Q. What are RA codes?	10:46:43
18	A. Repeat-accumulate codes.	10:46:45
19	Q. So repeat-accumulate codes are serial	10:46:48
20	concatenated codes, correct?	10:46:53
21	A. Repeat-accumulate codes are a particular	10:46:56
22	version of turbo codes, which were invented by the	10:47:01
23	set of -- or which were published by a set of	10:47:05
24	authors in an attempt to try to understand why turbo	10:47:10
25	codes which were introduced in '93 behaved so well.	10:47:15

1	It was at that point, you have to	10:47:17
2	imagine -- a, you know, quite a confused time in	10:47:19
3	which people didn't really understand why these	10:47:24
4	codes were doing so well. And whereas most people	10:47:27
5	at that point in time would have gone off and tried	10:47:32
6	to make codes more complicated and trying to get	10:47:35
7	even better numbers, you know, RA codes went the	10:47:40
8	opposite way and tried to simplify it in an attempt	10:47:44
9	to come up with something that was so simple that	10:47:49
10	potentially they could be analyzed.	10:47:52
11	They were never thought to be codes that	10:47:53
12	could potentially could actually be used in	10:47:57
13	practice. It was considered a toy or as a teaching	10:48:00
14	tool.	10:48:04
15	Q. So when you said RA codes "are a	10:48:04
16	particular version of turbo codes," what did you	10:48:07
17	mean?	10:48:12
18	A. You take an RA code, you take a turbo code	10:48:12
19	and you essentially eliminate everything and bring	10:48:14
20	it down to the simplest possible version which is	10:48:17
21	not revealed.	10:48:20
22	Q. Which is not trivial?	10:48:24
23	A. You -- you -- you're trying to eliminate	10:48:25
24	all kinds of complexity so that what you end up with	10:48:27
25	is still something that, you know, is not, you know,	10:48:31

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1	the empty set or not something empty. So it's the	10:48:36
2	simplest possible version which shows -- excuse	10:48:38
3	me -- which shows some characteristics of turbo	10:48:40
4	codes, but it was not intended to accurately reflect	10:48:42
5	what turbo codes do, nor was it ever intended to	10:48:46
6	match in any way the performance of turbo codes.	10:48:50
7	Q. I understand.	10:48:53
8	A. Okay.	10:48:54
9	Q. I'm just getting at what your	10:48:54
10	understanding of an RA code is.	10:48:56
11	And is it fair to say that an RA code is	10:48:58
12	an attempt to take a turbo code and simplify it down	10:49:01
13	to basic elements for the purpose of analysis?	10:49:06
14	A. Yes.	10:49:08
15	Q. Okay.	10:49:08
16	MR. DOWD: Let's mark as Exhibit 6, I	10:49:16
17	believe --	10:49:21
18	THE REPORTER: Yes.	10:49:21
19	MR. DOWD: -- a copy of the paper, "Coding	10:49:22
20	Theorems for 'Turbo-Like' Codes," by Divsalar et	10:49:25
21	al., bears Bates numbers HUGHES1916 through 1925.	10:49:32
22	(Urbanke Exhibit 6 was marked for	10:49:37
23	identification and attached to the	10:49:37
24	transcript.)	10:50:02
25	///	

1	BY MR. DOWD:	10:50:02
2	Q. Do you have Exhibit 6?	10:50:02
3	A. Yes.	10:50:04
4	Q. Do you recognize it?	10:50:04
5	A. Yes.	10:50:07
6	Q. What is it?	10:50:10
7	A. It's the paper entitled:	10:50:11
8	"Coding Theorems for Turbo-Like	10:50:13
9	Codes."	10:50:17
10	Q. And if I refer to this as the "Divsalar	10:50:17
11	paper," will that make sense to you?	10:50:21
12	A. Yes.	10:50:23
13	Q. When's the first time you saw the Divsalar	10:50:23
14	paper?	10:50:28
15	A. It must have been about the time when it	10:50:28
16	was published, so I guess '98, around that time, I	10:50:31
17	believe. I have to check exactly when the	10:50:38
18	publication date was.	10:50:40
19	Q. And how did you come to read it in '98?	10:50:42
20	A. Let me see if I see the conference --	10:50:54
21	either through the conference or I must've received	10:50:58
22	it by one of the office. Let me check.	10:51:02
23	So I must say I don't know exactly how I	10:52:02
24	first received it, but I assume that I, perhaps, saw	10:52:04
25	a talk that they gave relating to this, perhaps	10:52:08

1	the -- either the International Symposium of	10:52:13
2	Information Theory or perhaps at the Allerton	10:52:17
3	conference, could have been either.	10:52:20
4	Q. Okay. Is there a reason why this paper	10:52:22
5	sticks out in your mind?	10:52:24
6	A. Yes.	10:52:26
7	Q. Why is that?	10:52:26
8	A. Because IRA codes were an important	10:52:27
9	development of turbo codes exactly for the reason	10:52:32
10	that they simplified things and they showed a	10:52:34
11	particular analysis which is called the input/output	10:52:38
12	weight distribution analysis or -- and/or, you know,	10:52:42
13	he's referred I think in a particular sentence as	10:52:45
14	interleaver gain analysis, has various other names	10:52:49
15	in the literature.	10:52:52
16	And so this was, I believe, the first time	10:52:54
17	interleaver gain exponent conjecture -- sorry,	10:52:58
18	interleaver gain exponent conjecture and I believe	10:53:02
19	it's the first time that people managed to carry	10:53:03
20	through this analysis for something that looked like	10:53:09
21	a turbo code. And so that's why it was an important	10:53:12
22	paper in the development of coding theorem.	10:53:15
23	Q. Okay. Just as a digression, you mentioned	10:53:23
24	that you may have received a copy of this from one	10:53:31
25	of the authors; do you recall that?	10:53:35

1	A. I -- as I said, I don't recall whether or	10:53:36
2	not I downloaded it perhaps on a conference web page	10:53:39
3	or perhaps I received the paper directly, perhaps by	10:53:43
4	going to the conference, perhaps people might have	10:53:46
5	distributed the copy.	10:53:50
6	So there are various ways of -- of how	10:53:51
7	this might have happened, but I don't recall how I	10:53:52
8	might have first come to see it.	10:53:55
9	Q. We're going to come to this when we get to	10:53:57
10	the -- to your Richardson '99 paper, but was it	10:54:00
11	common at this time, '98, '99, 2000, for people	10:54:03
12	working in the field to e-mail copies of their	10:54:08
13	papers to each other?	10:54:11
14	MR. GLASS: Objection. Vague.	10:54:12
15	Go ahead.	10:54:13
16	THE WITNESS: Not very common, I think.	10:54:14
17	BY MR. DOWD:	10:54:16
18	Q. Okay. But it did happen?	10:54:17
19	A. It happened on occasions.	10:54:18
20	Q. All right. You mentioned the interleaver	10:54:21
21	gain exponent conjecture; do you recall that?	10:54:28
22	A. Yes.	10:54:32
23	Q. And that's referring to the fact that in	10:54:32
24	an RA code the repeat and the accumulate are	10:54:35
25	separated by an interleaver?	10:54:38

1	A. Yes.	10:54:40
2	Q. And the idea was, what, that the	10:54:41
3	interleaver approved performance over either of	10:54:44
4	those two codes alone?	10:54:47
5	A. The idea was that the -- the accumulate	10:54:50
6	itself is a trivial code that doesn't give any	10:54:56
7	coding gain whatsoever, but that for a particular	10:55:00
8	combination of these elements, nevertheless some not	10:55:04
9	very good, but a reasonable, you know, code could be	10:55:09
10	constructed. As I said, it was not a good code;	10:55:13
11	there were much better codes out there. These were	10:55:16
12	not considered to be any particularly ground	10:55:19
13	breaking codes. But they had some characteristics	10:55:24
14	of turbo codes, and since at that point the analysis	10:55:26
15	that one wanted to carry out for turbo codes was not	10:55:30
16	possible to do, it was carried out first here, just	10:55:33
17	showing that, in principal, some type of analysis	10:55:37
18	could be carried through for some codes that had	10:55:41
19	some of the characteristics of turbo codes.	10:55:46
20	THE REPORTER: Wait.	10:55:46
21	"Could be carried through"?	10:55:47
22	THE WITNESS: Carried through for some	10:55:47
23	codes that had some of the characteristics of turbo	10:55:50
24	codes.	10:55:53
25	///	

1	BY MR. DOWD:	10:55:54
2	Q. You mentioned a couple times the idea of a	10:55:54
3	good code; is your idea of a good code related to	10:55:58
4	its performance against the Shannon limit?	10:56:05
5	A. So there are many parameters in which a	10:56:07
6	code can be good. Let me just mention a few. It's	10:56:10
7	not a one dimensional issue.	10:56:13
8	Q. Uh-huh.	10:56:16
9	A. One important one is, indeed, the -- what	10:56:17
10	sometimes is called the gap to capacity, how close a	10:56:20
11	code can operate reliably close to the Shannon	10:56:24
12	limit. But there are many, many other parameters	10:56:28
13	that are important for a code.	10:56:32
14	The encoding complexity, that's the number	10:56:33
15	of operations that are needed to perform the	10:56:37
16	encoding operation; the decoding complexity, so the	10:56:39
17	number of operations that are required to perform	10:56:44
18	the decoding, these are both related also to the	10:56:47
19	energy consumption that the code has.	10:56:52
20	Further characteristics might be the error	10:56:55
21	floor that relates to whether or not a code, even	10:56:59
22	though it might be possible to decode essentially	10:57:04
23	all the bits, there might still be, with some	10:57:08
24	nonnegotiable probability, a few of the bits that	10:57:12
25	are left and cannot be decoded.	10:57:16

1	And, you know, these are, perhaps, some of	10:57:19
2	the main characteristics. Further ones that are	10:57:22
3	important in practice is how such a code could be	10:57:26
4	mapped into hardware. So depending on hardware or	10:57:28
5	software, depending on what platform, what	10:57:33
6	application.	10:57:36
7	And all of this together gives a fairly	10:57:36
8	complex vector that needs to be optimized, criteria	10:57:41
9	to be optimized. And depending on the application,	10:57:47
10	one would then judge which code would be best for	10:57:50
11	that particular application.	10:57:53
12	Q. Okay. And let me pause on that for a	10:57:54
13	minute. Am I correct that you could perform	10:57:58
14	miserably on all of those characteristics and still	10:58:01
15	be an IRA code?	10:58:04
16	MR. GLASS: Objection. Vague.	10:58:07
17	THE WITNESS: There are probably some	10:58:09
18	tweaks you can do. That probably would depend on	10:58:16
19	very fine definition of what you imply with an --	10:58:20
20	with an RA code. So you could probably on purpose,	10:58:23
21	trying to, you know, choose something that is very	10:58:29
22	bad.	10:58:33
23	BY MR. DOWD:	10:58:33
24	Q. And I'm using the definition of RA code	10:58:33
25	you gave me earlier.	10:58:35

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1	My only question is, some IRA codes could	10:58:37
2	be optimized to perform very well under these	10:58:43
3	criteria; some could be not optimized and perform	10:58:48
4	poorly on some or all of these criteria; both would	10:58:50
5	be IRA codes?	10:58:55
6	MR. GLASS: Objection. Vague. Outside	10:58:55
7	the scope.	10:58:56
8	Go ahead.	10:58:56
9	THE WITNESS: Not all. IRA codes are very	10:58:57
10	special in many -- in many parameters. So I agree	10:59:00
11	that, for example, in terms of the Shannon limit you	10:59:03
12	could have differences depending on how exactly one	10:59:05
13	chose it. But no matter how you do it, it will	10:59:08
14	always be linear time encodable and there will	
15	always --	
16	THE REPORTER: Hold on. Hold on. Slow	
17	down.	
18	"But no matter how" --	
19	Start there.	10:59:13
20	THE WITNESS: How you do it, there will	10:59:13
21	always be linear time encodable; there will be	10:59:16
22	linear time decodable, and they're very natural to	10:59:21
23	be mapped into, you know, hardware applications.	10:59:25
24	BY MR. DOWD:	10:59:28
25	Q. Okay. And so those characteristics,	10:59:28

1	linear time encodable, linear time decodable, easy	10:59:31
2	to map into hardware, that's also all true of RA	10:59:36
3	codes, right?	10:59:41
4	MR. GLASS: Same objections.	10:59:42
5	THE WITNESS: RA codes have some of these	10:59:43
6	characteristics, I agree, yes.	10:59:45
7	BY MR. DOWD:	10:59:47
8	Q. Those three that I just mentioned, right?	10:59:47
9	MR. GLASS: Same objections.	10:59:50
10	THE WITNESS: RA codes are linear time	10:59:54
11	encodable, that's correct.	10:59:56
12	BY MR. DOWD:	10:59:58
13	Q. And they're, from a hardware standpoint,	10:59:58
14	relatively easy to implement, correct?	11:00:00
15	A. That's correct.	11:00:04
16	Q. Okay. And I think we agreed a moment ago	11:00:04
17	that, with respect to the performance against the	11:00:07
18	Shannon limit or what you referred to as the gap to	11:00:11
19	capacity, you could have an IRA code that performs	11:00:15
20	very well or you could have an IRA code that	11:00:19
21	performs poorly, both of which would be IRA codes,	11:00:22
22	right?	11:00:28
23	MR. GLASS: Outside the scope. Outside	11:00:28
24	the scope.	11:00:31
25	THE WITNESS: Yes.	11:00:31

1	BY MR. DOWD:	11:00:31
2	Q. Okay. And that's also true of RA codes,	11:00:31
3	right?	11:00:35
4	MR. GLASS: Same objections.	11:00:35
5	THE WITNESS: RA codes almost uniformly	11:00:36
6	are not very good codes. I don't think you can have	11:00:38
7	RA codes that are very good codes in pretty much any	11:00:42
8	application.	11:00:45
9	BY MR. DOWD:	11:00:45
10	Q. Let me ask it a slightly different way,	11:00:46
11	because I meant to ask a different question, so	11:00:48
12	sorry.	11:00:51
13	You can have RA codes that perform closer	11:00:51
14	to the Shannon limit and RA codes that perform	11:00:54
15	farther away from the Shannon limit, right?	11:00:57
16	A. RA codes would be uniformly relatively far	11:01:02
17	away from the Shannon limit.	11:01:05
18	Q. I don't disagree with you that they would	11:01:07
19	all be probably worse than IRA codes, or maybe	11:01:10
20	there's an overlap, I don't know. But my point is	11:01:14
21	only that you can have better performing and worse	11:01:17
22	performing codes when you -- when you're looking at	11:01:20
23	as your criteria a gap to capacity, right?	11:01:24
24	MR. GLASS: Vague. Outside the scope.	11:01:26
25	THE WITNESS: I don't exactly agree	11:01:36

1	with -- with you, because RA codes, the way they are	11:01:37
2	is essentially one RA code for a particular rate	11:01:39
3	that you want. So -- so you cannot really compare	11:01:44
4	various RA codes for the same application. So	11:01:47
5	essentially there is one RA code that you have in	11:01:50
6	essence if you think about large ones.	11:01:53
7	So it's not really that you could compare	11:01:56
8	one with another one.	11:01:58
9	BY MR. DOWD:	11:02:01
10	Q. I don't want to spend too much time on	11:02:03
11	this because I think I'm together with you, but you	11:02:05
12	can design different RA codes for different rates,	11:02:08
13	right?	11:02:11
14	A. Right.	11:02:11
15	Q. Those may perform closer to the Shannon	11:02:12
16	limit or farther away from the Shannon limit for	11:02:17
17	that particular channel?	11:02:19
18	MR. GLASS: Same objections.	11:02:22
19	THE WITNESS: The Shannon limit is a	11:02:23
20	function of the rate, so you cannot really directly	11:02:24
21	compare these.	11:02:27
22	BY MR. DOWD:	11:02:28
23	Q. I understand that. What I'm saying is	11:02:28
24	that if you look from channel to channel, sometimes	11:02:31
25	the RA code will be closer and sometimes it will be	11:02:37

1	farther away.	11:02:39
2	THE REPORTER: "From channel"?	11:02:39
3	Hold on.	11:02:39
4	"From channel to channel"?	11:02:39
5	BY MR. DOWD:	11:02:39
6	Q. Sometimes the RA code will be closer;	11:02:37
7	sometimes it will be farther away?	11:02:39
8	MR. GLASS: Same objections.	11:02:40
9	THE WITNESS: You would have to give me a	11:02:41
10	definition of what "closeness" means since we are	11:02:43
11	not talking about the same case. You're comparing	11:02:45
12	essentially apples to oranges, so unless you give me	11:02:48
13	a definition of what the -- you know, what the --	11:02:52
14	what the difference the Shannon limit would be for	11:02:54
15	various different rates and how you would compare	11:02:55
16	different cases I cannot answer that question.	11:02:59
17	BY MR. DOWD:	11:03:01
18	Q. All right. We can -- we can come back to	11:03:02
19	that.	11:03:04
20	MR. DOWD: Why don't we take our first	11:03:10
21	break.	11:03:12
22	THE VIDEOGRAPHER: Going off the record.	11:03:13
23	The time is 11:03 a.m.	11:03:14
24	(Recess taken at 11:03 a.m.)	11:03:16
25	THE VIDEOGRAPHER: We are back on the	11:11:24

1	record. The time is 11:11 a.m.	11:11:25
2	BY MR. DOWD:	11:11:28
3	Q. Now, before the break we discussed	11:11:29
4	Dr. MacKay at one point; do you recall that?	11:11:33
5	A. Yes.	11:11:36
6	Q. Do you know Dr. MacKay?	11:11:36
7	A. Yes.	11:11:38
8	Q. Have you met him personally?	11:11:39
9	A. Yes.	11:11:41
10	Q. How do you know him?	11:11:41
11	A. I met him at conferences. He also visited	11:11:42
12	me, I think, on one or two occasions at EPFL as a	11:11:45
13	speaker as we have many other people that are	11:11:49
14	visiting. And I might have been once at -- I'm not	11:11:52
15	sure if it was Cambridge or at least some university	11:11:55
16	in the UK where he had organized the workshop and I	11:11:59
17	was invited as one of the speakers there too.	11:12:03
18	Q. Okay. Back in this time frame, '98	11:12:06
19	through about 2000, were you aware of Dr. MacKay's	11:12:10
20	work?	11:12:14
21	A. This was a very, very confused time frame,	11:12:15
22	so just maybe a little bit to set the stage.	11:12:17
23	Essentially there was the invention of turbo codes	11:12:23
24	in '93, and starting, perhaps, in '95, there were	11:12:25
25	three or four different groups that, from very	11:12:29

1	different directions, started to working on coding.	11:12:32
2	Some of them were traditional people in	11:12:35
3	coding, typically in the E community, typically	11:12:39
4	trying to improve turbo codes.	11:12:41
5	But at the -- at the same time, there were	11:12:43
6	two other groups that got into the game; one was	11:12:45
7	David MacKay, and I think Dr. Frey at some point	11:12:50
8	connected up with him and there were several papers	11:12:56
9	together.	11:13:01
10	They essentially rediscovered what is	11:13:01
11	called the Gallagher codes or LDPC codes and -- at	11:13:03
12	some point and, you know, realized that they had	11:13:09
13	rediscovered concepts from the '60s.	11:13:11
14	At the same time they had a background in	11:13:14
15	physics. Brendan Frey probably is more computer	11:13:18
16	science.	11:13:23
17	On the other hand, there was a group	11:13:25
18	involving Luby and his co-authors. They have a	11:13:28
19	background of theoretical computer science and	11:13:32
20	mathematics and they were interested in a completely	11:13:35
21	different aspect, not the physical layer	11:13:39
22	applications or transmission but they were	11:13:41
23	interested in content distribution.	11:13:45
24	And they, themselves, have started	11:13:47
25	independently, particularly Spielman and --	11:13:50

1	THE REPORTER: Wait. Wait. I need you to	11:13:55
2	repeat that again. I didn't understand it.	11:13:56
3	THE WITNESS: Right. So they, themselves,	11:13:56
4	in particular amongst a group of authors that are on	11:13:58
5	the Luby et al., papers, in particular Spielman and	11:14:01
6	Luby themselves, have started independently in	11:14:08
7	various groups, at some point they connected, and	11:14:11
8	they were interested in content distribution.	11:14:14
9	And they also rediscovered a version of	11:14:18
10	Gallagher codes and a version of this decoding	11:14:20
11	algorithm. And at some point realized that they had	11:14:24
12	basically rediscovered that concept themselves.	11:14:29
13	Now, all these groups were in very	11:14:31
14	different communities, some of them in theoretical	11:14:35
15	computer science. They would publish at conferences	11:14:38
16	like STOCK or FOX which are theoretical computer	11:14:40
17	science conferences.	11:14:44
18	MacKay had a physics background, that	11:14:44
19	meant, again, he would, even though he had a	11:14:50
20	similar goal of coming up with error correcting	11:14:55
21	codes, would have a very different --	11:14:55
22	THE REPORTER: Wait.	11:14:55
23	"Even though he had a similar goal"?	11:14:57
24	THE WITNESS: Goal of finding good error	11:14:57
25	correcting codes, he would use a very, very	11:15:02

1	different language.	11:15:04
2	And then there were people in EE that used	11:15:05
3	traditional language that is used for coding. And	11:15:08
4	it took quite a while for these groups to somehow	11:15:11
5	merge to find a common language and to understand	11:15:14
6	that they were talking about similar concepts or the	11:15:18
7	same concepts but expressed in this very different	11:15:21
8	languages.	11:15:24
9	BY MR. DOWD:	11:15:26
10	Q. Have you finished your answer?	11:15:26
11	A. Yes.	11:15:28
12	Q. So my question was, were you familiar with	11:15:31
13	Dr. MacKay's work in 1998 through 2000?	11:15:34
14	A. Certainly by the year 2000, I would have	11:15:37
15	known him.	11:15:40
16	Q. How about '99?	11:15:41
17	A. I would have to -- you know, I cannot be	11:15:49
18	absolutely positive, but it's -- it's possible,	11:15:52
19	yeah.	11:15:54
20	Q. What's your best understanding?	11:15:54
21	A. Now, in the '99 preprint version of our	11:16:14
22	paper, he's not cited as one of the references. So	11:16:18
23	perhaps he was at that point not high on my radar	11:16:22
24	screen. Whether I heard his name before it or not,	11:16:25
25	I cannot swear. Right now I don't know. But he's	11:16:29

1	not as one -- listed as one of the references in	11:16:32
2	the -- in the '99 paper, which was '99, April 6.	11:16:34
3	So at that point he was not mentioned in	11:16:37
4	the list of references.	11:16:39
5	Q. When did he first give a visiting lecture	11:16:40
6	at your university?	11:16:44
7	A. Oh, perhaps 2004, 2005. I don't know.	11:16:45
8	Perhaps later.	11:16:49
9	Q. Now, you talked about a group in the	11:16:51
10	physics or computer science area; you talked about a	11:16:55
11	group in the coding theory area?	11:16:59
12	A. Right.	11:16:59
13	Q. Do you recall that?	11:17:02
14	A. Right.	11:17:03
15	Q. The group in the computer science physics	11:17:05
16	area is looking at LDPC codes, right?	11:17:09
17	A. Yes, they rediscovered something which	11:17:14
18	later turned out to be LDPC codes.	11:17:16
19	Q. And that's Luby MacKay?	11:17:19
20	A. No, MacKay was not part of this group.	11:17:22
21	Q. Okay.	11:17:22
22	A. It's Luby -- it's Luby, Mitzenmacher,	11:17:26
23	Shokrollahi and Spielman, so these are the main	11:17:28
24	actors in that round.	11:17:32
25	Q. And then we've been talking before about	11:17:33

1	Divsalar and the RA codes?	11:17:35
2	A. Right.	11:17:36
3	Q. You say that's a different group working	11:17:36
4	on different types of research?	11:17:39
5	A. Yes.	11:17:41
6	Q. Is your opinion in the case based on a	11:17:42
7	belief that a person in the RA codes group would not	11:17:47
8	have been aware of the Luby '97, Luby '98,	11:17:51
9	Richardson '99 papers?	11:17:57
10	A. It's my opinion that they were not widely	11:17:58
11	read. There certainly must have been some people	11:18:03
12	that were aware. I first became aware when Aamod	11:18:06
13	joined Bell Labs --	11:18:06
14	THE REPORTER: "I first became aware" --	11:18:06
15	THE WITNESS: I first became aware of that	11:18:13
16	line of work when Aamod joined Bell Labs. I believe	11:18:13
17	it was '99, although I don't know the exact date	11:18:18
18	when he joined.	11:18:22
19	At that point he told us -- since he was	11:18:22
20	part of the other group as well, he told us about	11:18:25
21	that work and I became aware of that work.	11:18:28
22	BY MR. DOWD:	11:18:28
23	Q. Let me ask you, then, the direct question.	11:18:31
24	Is it your opinion that a person of	11:18:34
25	ordinary skill in the art in 1999 would not have	11:18:38

1	been aware of the Luby '97 and Luby '98 references?	11:18:43
2	A. It's very unlikely that they would have	11:18:46
3	been aware.	11:18:50
4	Q. And is your opinion in the case based on	11:18:50
5	them not being aware of those references?	11:18:52
6	A. Sorry, what was the first question? I	11:18:55
7	thought these were different questions. I -- can	11:18:57
8	you repeat the first question again, please.	11:18:59
9	Q. The -- are the opinions that you've	11:18:59
10	expressed in your report in this case based on your	11:19:02
11	belief that a person of ordinary skill would not	11:19:04
12	have been aware of the Luby '98 or '98 --	
13	A. No --	
14	THE REPORTER: Wait. Wait. Hold on.	
15	MR. DOWD: Yes, sir.	
16	THE REPORTER: You need to slow down for	
17	me, please.	
18	And you need to allow him to ask the	
19	complete --	
20	THE WITNESS: Sorry.	
21	THE REPORTER: -- question before you	
22	answer.	
23	THE WITNESS: Sorry.	
24	THE REPORTER: Okay? Can I get a clean	
25	question without interruption, please.	11:19:22

1	BY MR. DOWD:	11:19:22
2	Q. Are the opinions that are expressed in	11:19:25
3	your report based on your belief that a person of	11:19:28
4	ordinary skill in information theory would not have	11:19:31
5	been aware of the Luby '97 or Luby '98 references?	11:19:35
6	A. No, not entirely. There's simply one	11:19:38
7	other aspect that I mentioned, but...	11:19:41
8	Q. Okay. So when you say they're "not	11:19:43
9	entirely," are they based in part on your belief	11:19:46
10	that a person of ordinary skill in information	11:19:48
11	theory would not have been aware of Luby '97 and	11:19:50
12	Luby '98?	11:19:54
13	A. No, let me rephrase it.	11:19:55
14	My opinion that it would have been not	11:19:57
15	obvious to combine this is not based on the fact	11:19:59
16	that they would not have been available. But I also	11:20:02
17	expressed the opinion that these papers at that	11:20:05
18	point in time would have been very unlikely to be	11:20:07
19	known by people in various areas.	11:20:10
20	Q. "Unlikely to be known," is that what you	11:20:12
21	said?	11:20:15
22	A. That someone of ordinary skills would have	11:20:15
23	been aware of these papers.	11:20:19
24	Q. It is "unlikely"?	11:20:19
25	A. It's very unlikely, yes.	11:20:21

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1	Q. Okay. And your opinions in your report	11:20:23
2	are in part based on that belief, correct?	11:20:25
3	A. No, it's just one other aspect that I	11:20:27
4	mentioned.	11:20:31
5	Q. Well, when you say it's one aspect that	11:20:31
6	you mentioned, am I correct that you mention it	11:20:34
7	because it affects your opinions in this case?	11:20:36
8	A. It doesn't -- it doesn't affect the	11:20:38
9	opinion whether a person of ordinary skills could	11:20:41
10	have combined it. I just thought that I also	11:20:44
11	mentioned that these were completely different	11:20:47
12	communities. And so it's another reason that a	11:20:49
13	person might not have even been aware of the papers.	11:20:52
14	Q. Okay. So you have no actual basis to	11:20:55
15	believe that there was not a person in 1999 who, in	11:20:58
16	fact, knew about Richardson '99, Luby '98, Luby '97,	11:21:04
17	and the Divsalar paper?	11:21:11
18	A. I cannot be certain that there were no --	11:21:14
19	no people that knew all these papers combined.	11:21:17
20	That's correct.	11:21:21
21	Q. Okay. Let's go back to the Divsalar	11:21:22
22	paper, Exhibit 6. And I'd like to focus on the --	11:21:28
23	the Figure 3, which you had reproduced in your	11:21:33
24	report, which appears on Page 5, original Page 5 of	11:21:37
25	the Divsalar paper.	11:21:46

1	Do you have that?	11:21:47
2	A. Yes.	11:21:48
3	Q. And I'd like to walk through how this	11:21:48
4	works from left to right, okay?	11:21:51
5	A. Right.	11:21:55
6	Q. So what's shown here in Figure 3 and	11:21:56
7	discussed on Page 5 is a method of encoding a	11:21:59
8	signal, right?	11:22:05
9	A. That's correct.	11:22:06
10	Q. And reading from left to right, the first	11:22:06
11	thing that happens is that the encoder receives a	11:22:09
12	block of data N in the signal to be encoded, right?	11:22:14
13	MR. GLASS: Objection. Calling for a	11:22:18
14	legal conclusion.	11:22:21
15	THE WITNESS: On a technical basis,	11:22:21
16	there's a stream of bits that come in there. And	11:22:23
17	these bits are repeated by factor Q.	11:22:27
18	BY MR. DOWD:	11:22:30
19	Q. Well, if you look above the figure, do you	11:22:31
20	see the third sentence of the paragraph where it	11:22:35
21	says:	11:22:37
22	"An information block of length N"?	11:22:37
23	A. The third -- can you just please, again,	11:22:42
24	say where it is.	11:22:45
25	Q. Yes. Above the figure, the third sentence	11:22:46

1	of the paragraph, says:	11:22:50
2	"An information block of length N."	11:22:52
3	Do you see that?	11:22:53
4	A. Yes.	11:22:54
5	Q. And then in the figure we see, there's N	11:22:55
6	coming in from the left, right?	11:22:58
7	A. Yes.	11:23:00
8	Q. So that is a block of information bits,	11:23:00
9	right?	11:23:03
10	MR. GLASS: Same objection. Outside the	11:23:03
11	scope. Calling for a legal conclusion.	11:23:05
12	THE WITNESS: To me it could be a block;	11:23:08
13	it could be a sequence. It's information that	11:23:11
14	starts at some point in time.	11:23:14
15	BY MR. DOWD:	11:23:15
16	Q. Okay. And at least we know the Divsalar	11:23:15
17	paper says it's a "block of length N," right?	11:23:19
18	A. There is a sentence that contains the word	11:23:25
19	"block," yes.	11:23:27
20	Q. Now, the next thing that happens is the	11:23:37
21	encoder in Figure 3 performs an encoding operation	11:23:58
22	using the N information bits as the input, right?	11:24:08
23	A. How do you mean "the next" -- the whole	11:24:15
24	diagram represents the encoding.	11:24:17
25	Q. Okay. Well, let's see if we can just	11:24:18

1	agree that the encoder of Figure 3 performs an	11:24:21
2	encoding operation using the N information bits as	11:24:25
3	its input, right?	11:24:30
4	MR. GLASS: Same objections.	11:24:31
5	THE WITNESS: So there is a sequence of	11:24:33
6	bits that are shifted into this register or into	11:24:37
7	this particular systems. You know, the whole	11:24:42
8	diagram is a systems point of view in which you have	11:24:44
9	various boxes and information shifted from the left	11:24:47
10	to the right, and as it is shifted through, every	11:24:50
11	box performs certain operations on that particular	11:24:53
12	sequence.	11:24:57
13	BY MR. DOWD:	11:24:57
14	Q. Okay. And in a repeat-accumulate code,	11:24:58
15	the repeat-accumulate code, like what's shown in	11:25:06
16	Figure 3, will perform an encoding operation, right?	11:25:10
17	MR. GLASS: Same objections. Calling for	11:25:14
18	a legal conclusion. Outside the scope of the expert	11:25:16
19	report.	11:25:20
20	THE WITNESS: So the systems point of view	11:25:26
21	is a point of view in which information is	11:25:28
22	transformed, and that overall description is a	11:25:35
23	description of an encoder, yes.	11:25:37
24	BY MR. DOWD:	11:25:39
25	Q. Okay. Let's just focus briefly on what	11:25:39

1	each one of these blocks is, okay; do you have that	11:25:42
2	in mind?	11:25:46
3	A. Sure.	11:25:47
4	Q. The first block is a rate 1 over Q	11:25:47
5	repetition encoder, right?	11:25:51
6	A. Correct.	11:25:52
7	Q. The next block labeled: "P," that's an	11:25:52
8	interleaver, right?	11:25:56
9	A. Correct.	11:25:57
10	Q. And then the final block labeled:	11:25:58
11	"Rate-1, one over one plus D," that's an	11:26:02
12	accumulation block, right?	11:26:05
13	A. Correct.	11:26:07
14	Q. Okay. So the encoding operation will	11:26:08
15	include repeating the N bits Q times in the repeater	11:26:15
16	block, right?	11:26:20
17	A. The repetition will repeat incoming bits,	11:26:21
18	every incoming bit Q times; that's correct.	11:26:25
19	Q. Okay. And that means every bit in the	11:26:29
20	block of N bits will be repeated Q times, right?	11:26:32
21	A. Each of the incoming bits will be repeated	11:26:36
22	Q times --	11:26:36
23	(Overlapping speakers.)	11:26:36
24	THE REPORTER: Wait. I -- go ahead.	11:26:39
25	MR. GLASS: Same objections. Outside the	11:26:39

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1	scope. I didn't mean to interrupt.	11:26:42
2	THE REPORTER: It's okay.	11:26:42
3	And then can I get your answer again,	11:26:42
4	please.	11:26:43
5	THE WITNESS: Incoming bits, every	11:26:43
6	incoming bit will be repeated Q times.	11:26:48
7	BY MR. DOWD:	11:26:51
8	Q. And that's every bit of the information	11:26:51
9	block N, right?	11:26:54
10	MR. GLASS: Same objections.	11:26:55
11	THE WITNESS: Now, you know, this paper is	11:26:58
12	not particularly the one that I was asked to opinion	11:27:02
13	on. And, you know, it's not clear to me that I	11:27:05
14	would like to do another realtime analysis of this	11:27:11
15	particular paper. I was not asked to do so for my	11:27:15
16	expert report.	11:27:19
17	BY MR. DOWD:	11:27:21
18	Q. Well, sir, this figure appears in	11:27:22
19	Paragraph 54 of your expert report, correct?	11:27:25
20	A. That's true. And it's -- in general it's	11:27:26
21	a -- you know, a particular repeat --	11:27:30
22	repeat/accumulate code, takes information, repeats	11:27:34
23	it Q times, permutes it, and then puts it through an	11:27:36
24	accumulator.	11:27:42
25	Q. All right. So let's walk through how that	11:27:43

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1	works.	11:27:47
2	The output of the repeater is shown as qN	11:27:47
3	bits, right?	11:27:51
4	A. Correct.	11:27:52
5	MR. GLASS: Same objections.	11:27:53
6	BY MR. DOWD:	11:27:54
7	Q. And that means that there are Q copies of	11:27:54
8	each of the N bits, right?	11:27:57
9	MR. GLASS: Same objections. Outside the	11:27:59
10	scope.	11:28:01
11	THE WITNESS: As I said, a repeat	11:28:14
12	accumulator code takes bits, repeats them, permutes	11:28:16
13	them, and then accumulates them. That's what I've	11:28:21
14	also written in my expert report. These are the	11:28:25
15	components. And that's the degree to which I have,	11:28:30
16	you know, examined the exact ramifications of that	11:28:35
17	particular scheme.	11:28:38
18	BY MR. DOWD:	11:28:39
19	Q. Well, what -- what I'd like to do is --	11:28:40
20	and I understand you've said that, but let's walk	11:28:42
21	through the pieces of that so that we can understand	11:28:46
22	and be on the same page.	11:28:48
23	So "yes," "no," "I don't know."	11:28:51
24	The rate-1 over Q repetition block will	11:28:54
25	produce at its output qN repeated bits?	11:28:59

Line		Time
1	MR. GLASS: Same objections. Outside the	11:29:05
2	scope.	11:29:06
3	THE WITNESS: The repetition will take	11:29:06
4	every incoming bit and will repeat it Q times.	11:29:11
5	BY MR. DOWD:	11:29:14
6	Q. Okay. And is there something about the	11:29:14
7	math that would yield a different result than qN	11:29:17
8	repeated bits?	11:29:20
9	MR. GLASS: Vague. Outside the scope.	11:29:20
10	Go ahead.	11:29:22
11	THE WITNESS: What a repeater does, that's	11:29:23
12	exactly what it does. It takes every single bit,	11:29:27
13	repeats it Q times.	11:29:30
14	BY MR. DOWD:	11:29:34
15	Q. Okay.	11:29:34
16	A. That's what a repeater does.	11:29:32
17	Q. All right. And then those qN repeated	11:29:34
18	bits are input to the interleaver P, right?	11:29:37
19	A. The stream of information that's coming in	11:29:40
20	with the permuted bits is then being interleaved;	11:29:42
21	that's correct.	11:29:48
22	Q. Okay. And what happens in the interleaver	11:29:49
23	P is that you change the order of the bits, right?	11:29:53
24	MR. GLASS: Same objections.	11:29:57
25	THE WITNESS: That's correct.	11:29:58

1	BY MR. DOWD:	11:29:59
2	Q. Then the qN repeated bits are output from	11:30:00
3	the interleaver and input to the accumulator block,	11:30:08
4	right?	11:30:13
5	A. You take the stream off bits that come out	11:30:13
6	of the interleaver and you put it through an	11:30:17
7	accumulator, yes.	11:30:21
8	Q. And that's shown in the figure as the qN	11:30:21
9	bits going into the rate-1 accumulator, right?	11:30:24
10	A. I see a symbol qN appearing and an error	11:30:27
11	that goes into the rate-1 one plus one over D block.	11:30:30
12	THE REPORTER: Wait.	11:30:30
13	"Going to the rate" --	11:30:30
14	Start there, please.	11:30:34
15	THE WITNESS: I'm -- I'm seeing a symbol	11:30:34
16	called qN which goes into a rate-1 one plus one over	11:30:38
17	D block.	11:30:44
18	BY MR. DOWD:	11:30:48
19	Q. And if we go back to the same sentence	11:30:48
20	that I was pointing at before, it says:	11:30:50
21	"An information block of length N is	11:30:52
22	repeated Q times, scrambled by an	11:30:55
23	interleaver of size qN, and then encoded	11:30:59
24	by a rate-1 accumulator."	11:31:02
25	Right?	11:31:05

1	A. I see the sentence.	11:31:05
2	Q. And that is what is shown in Figure 3,	11:31:08
3	right?	11:31:19
4	A. That's one possible interpretation, yes.	11:31:19
5	Q. Now, what happens in the accumulation step	11:31:25
6	is shown in the paper in the formula here, Figure --	11:31:32
7	I'm sorry, Formula 5.1, right?	11:31:36
8	MR. GLASS: Objection. Outside the scope.	11:31:41
9	THE WITNESS: It was not my task to	11:31:49
10	examine in detail the paper in here. So this might	11:31:51
11	very well be correct, but I have not done an	11:31:55
12	in-depth analysis of this particular paper.	11:31:58
13	BY MR. DOWD:	11:32:00
14	Q. I'll tell you what, take a moment and read	11:32:00
15	the fourth sentence of the paragraph right above the	11:32:03
16	figure, the one that says:	11:32:07
17	"The accumulator can be viewed."	11:32:08
18	Do you see that there?	11:32:11
19	A. Yes, I see that.	11:32:12
20	Q. Read that down to the end of Formula	11:32:14
21	5.1 and let me know when you're read it.	11:32:20
22	A. I've read it.	11:32:52
23	Q. Okay. And let me start with, prior to	11:32:54
24	today, had you read the description of Figure 3 in	11:32:58
25	Divsalar?	11:33:03

1	A. I've read that paper certainly sometime,	11:33:03
2	yes.	11:33:07
3	Q. Okay. For the purposes of preparing your	11:33:07
4	report, did you perform an analysis of the Divsalar	11:33:09
5	disclosure and how the components of Figure 3 work?	11:33:13
6	A. I did not look at the particular claims	11:33:16
7	and try to match them up or in any way analyze them	11:33:20
8	with respect to this particular paper.	11:33:24
9	Q. And I'm -- I'm not asking about that. I'm	11:33:26
10	asking, did you perform any analysis of how the	11:33:28
11	individual components disclosed here in Figure 3 are	11:33:31
12	described to work by the Divsalar paper?	11:33:35
13	A. You're talking about how the component is	11:33:40
14	disclosed in the patent relating to what's written	11:33:44
15	here in this particular paper?	11:33:46
16	Q. No. So let me ask my question, again.	11:33:48
17	A. Okay.	11:33:51
18	Q. My question is, we've got the repeater;	11:33:51
19	we've got the permuter; we've got the accumulator	11:33:55
20	shown in Figure 3 of Divsalar.	11:34:00
21	A. Sure.	11:34:02
22	Q. And my question is, in preparing your	11:34:03
23	opinions in this case, did you perform any analysis	11:34:05
24	of how Divsalar explains those components operating?	11:34:08
25	A. Could you explain a little bit more what	11:34:16

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1	you mean with "analysis".	11:34:19
2	Q. Did you do anything to understand	11:34:20
3	Divsalar's disclosure of how Figure 3 operates?	11:34:23
4	A. "Disclosure" here means the paper?	11:34:26
5	Q. Means the paper Divsalar that you have	11:34:29
6	marked in front of you as Exhibit 6 that --	11:34:32
7	(Overlapping speakers.)	11:34:32
8	THE WITNESS: If that's the paper, if	11:34:35
9	that's what you mean, yes, I've read the paper.	11:34:36
10	BY MR. DOWD:	11:34:36
11	Q. Okay. So let's focus on the accumulator	11:34:39
12	and focus on how it works, okay?	11:34:40
13	Do you have that in mind?	11:34:43
14	A. I see the accumulator, yes.	11:34:46
15	Q. The accumulator in Figure 3 operates	11:34:51
16	according to the formula 5.1, right?	11:34:54
17	MR. GLASS: Objection. Outside the scope.	11:34:58
18	THE WITNESS: As I said, I did not prepare	11:35:00
19	an in-depth analysis how that might relate to	11:35:01
20	various components disclosed in the patent. I feel	11:35:04
21	uncomfortable having to do this on the spot.	11:35:06
22	BY MR. DOWD:	11:35:09
23	Q. I'm not asking you about the patent; I'm	11:35:09
24	asking you about what Divsalar discloses.	11:35:11
25	A. Okay. I -- this is a publication. I've	11:35:14

1	read the publication. I understand what the	11:35:15
2	publication says.	11:35:17
3	Q. All right. So am I correct that the	11:35:19
4	accumulator of Figure 3 in Divsalar operates	11:35:21
5	according to the Formula 5.1 in Divsalar immediately	11:35:25
6	above the figure?	11:35:29
7	MR. GLASS: Same objections. Outside the	11:35:30
8	scope.	11:35:32
9	THE WITNESS: It is written here that this	11:35:32
10	formula exactly -- it is written here that this	11:35:35
11	formula represents some accumulation.	11:35:38
12	BY MR. DOWD:	11:35:38
13	Q. All right. So let's walk through how the	11:35:42
14	accumulation of the formula in Figure 5.1 operates.	11:35:44
15	Now, you see in the text it says:	11:35:52
16	"The accumulator can be viewed as a	11:35:54
17	truncated rate-1 recursive convolutional	11:35:56
18	encoder with transfer function one over	11:36:00
19	one plus D, but we prefer to think of it	11:36:03
20	as a block code whose input block, X sub	11:36:06
21	one through X sub N, and output block, Y	11:36:10
22	sub one through Y sub N, are related by	11:36:14
23	the formula..."	11:36:16
24	And then it gives the formula, right?	11:36:18
25	A. Correct.	11:36:20

1	Q. So the input to the accumulation is the	11:36:20
2	block X sub one through X sub N, right?	11:36:23
3	MR. GLASS: Objection. Outside the scope.	11:36:27
4	THE WITNESS: He has here an input of X to	11:36:28
5	X1. I'll remark that whether or not you are	11:36:32
6	thinking of it as a block --	11:36:32
7	THE REPORTER: Wait. Wait. Hold on.	11:36:32
8	Start that part over. I didn't catch it.	11:36:38
9	THE WITNESS: Whether or not you're	11:36:38
10	thinking of this as a block or you consider this a	11:36:40
11	block or an infinite stream, it would be exactly the	11:36:44
12	same formula.	11:36:48
13	BY MR. DOWD:	11:36:49
14	Q. Okay. But what Divsalar actually says is	11:36:49
15	that it's an input block X sub one through X sub N,	11:36:52
16	right?	11:36:56
17	MR. GLASS: Same objections.	11:36:56
18	THE WITNESS: If you say so, yes.	11:36:57
19	BY MR. DOWD:	11:36:59
20	Q. I mean, am I reading that incorrectly?	11:36:59
21	A. As I said, I did not do an in-depth	11:37:02
22	analysis and I prefer not to do so now on this spot.	11:37:04
23	Q. I -- really, you know, my question doesn't	11:37:09
24	get at what you'd prefer to do or what you wouldn't.	11:37:11
25	My question is, is it correct that the	11:37:14

1	input to the accumulator, as taught in Divsalar, is	11:37:17
2	an input block X sub one through X sub N?	11:37:20
3	MR. GLASS: Same objections.	11:37:24
4	THE WITNESS: The sequence of bits --	11:37:24
5	THE REPORTER: Wait. Wait. You didn't	11:37:24
6	allow him to give his objection. It's very	11:37:24
7	important.	11:37:24
8	Can you give your answer over, please.	11:37:32
9	THE WITNESS: As I said, such a code works	11:37:32
10	by taking a sequence of bits, putting it into the	11:37:34
11	sequence -- into the sequence of blocks that you	11:37:38
12	have and you get a sequence of bits out. That's my	11:37:40
13	understanding of RA codes and that's my definition	11:37:43
14	that I would like to use.	11:37:48
15	BY MR. DOWD:	11:37:50
16	Q. Okay. So when Divsalar says that the	11:37:50
17	input to the accumulator is, quote: "Input block X	11:37:53
18	sub one through X sub N," can you tell me "yes,"	11:37:56
19	"no," "I don't know," that's the input to the	11:38:00
20	accumulator?	11:38:02
21	A. I see a sentence in which it says there's	11:38:04
22	a block whose input is X1 up to XN. That's what I	11:38:07
23	see.	11:38:12
24	Q. Okay. And then it continues that the	11:38:12
25	output block is Y sub one through Y sub N, right?	11:38:14

1	A. I'm -- all I'm doing is here reading that	11:38:17
2	there's an output block Y1 to YN. I'm not forming	11:38:19
3	any opinion on that.	11:38:23
4	Q. Okay. And let's talk about the	11:38:24
5	relationship between those blocks described by the	11:38:27
6	Formula 5.1.	11:38:30
7	Do you see that there?	11:38:31
8	A. I see the Formula 5.1; that's correct.	11:38:32
9	O. Now, X1 through XN, those are the qN	11:38:37
10	repeated bits, right?	11:38:43
11	MR. GLASS: Outside the scope.	11:38:46
12	THE WITNESS: According to his definition	11:38:47
13	here, there is some bits called X1 and they are	11:38:51
14	accumulated, yes.	11:38:56
15	BY MR. DOWD:	11:38:58
16	Q. Okay. And the accumulator performs XOR	11:38:58
17	sums on subsets of those bits, right?	11:39:03
18	MR. GLASS: Same objections. Outside the	11:39:05
19	scope.	11:39:07
20	THE WITNESS: The accumulator does what an	11:39:07
21	accumulator does; it exactly sums up the sequence of	11:39:09
22	bits.	11:39:12
23	BY MR. DOWD:	11:39:12
24	Q. Using an XOR summing, right?	11:39:13
25	MR. GLASS: Same objection.	11:39:15

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1	THE WITNESS: It -- it's a summation; it's	11:39:15
2	a mathematical operation; it's a sum.	11:39:18
3	BY MR. DOWD:	11:39:18
4	Q. And when you perform a mathematical	11:39:22
5	summing operation on bits, you're using either mod 2	11:39:24
6	or exclusive OR mathematics, right?	11:39:28
7	MR. GLASS: Same objection.	11:39:31
8	THE WITNESS: Now we're talking about --	
9	MR. GLASS: Outside the scope.	
10	THE REPORTER: Wait. Wait. You've got to	
11	allow a pause for him to get in an objection,	
12	please; otherwise, I hear two people speaking at the	
13	same time and I can't take it down.	
14	THE WITNESS: I apologize.	
15	MR. GLASS: I was just going to say	
16	outside the scope.	
17	THE REPORTER: Thank you. I appreciate	
18	it.	
19	MR. GLASS: Go ahead.	11:39:45
20	THE WITNESS: To me, it's a plus that's	11:39:45
21	well-defined in mathematics. There might be many	11:39:47
22	ways of representing it -- it's a plus, okay?	11:39:51
23	BY MR. DOWD:	11:39:53
24	Q. Okay. And is there something about --	11:39:53
25	withdrawn.	11:39:53

1	That plus sign represents an exclusive OR	11:39:56
2	operation, correct?	11:40:00
3	A. Perhaps you can think of this. It is	11:40:01
4	simply a sum of elements in the field of GF(2).	11:40:04
5	Q. In the field GF(2)?	11:40:08
6	A. Yes, that's what it's called.	11:40:11
7	Q. Well, if I have two bits and I'm adding	11:40:14
8	those two bits together and I show you the two bits	11:40:18
9	with a plus side between them, you would know that	11:40:22
10	you could perform an XOR operation to do the	11:40:25
11	summation, right?	11:40:29
12	A. There might be --	11:40:30
13	MR. GLASS: Same objection.	11:40:30
14	THE WITNESS: There might be --	11:40:30
15	MR. GLASS: Outside the scope.	11:40:31
16	Go ahead.	11:40:32
17	THE WITNESS: Sorry. There might be many	11:40:32
18	ways of doing it. This is not what my expert report	11:40:34
19	is about. My expert report is about the general	11:40:37
20	definition. To me this is a plus -- it's a plus in	11:40:40
21	GF(2); that's what it is mathematically. There	11:40:44
22	might be many other ways of representing it. That's	11:40:47
23	not my -- that's not what my expert report is about.	11:40:50
24	BY MR. DOWD:	11:40:52
25	Q. Okay. My question is, if I tell you to	11:40:52

1	add a 1 and a 0, two bits, and I show that with a	11:40:56
2	plus sign, you would understand that one way to do	11:41:02
3	that is through an exclusive OR operation; "yes" or	11:41:07
4	"no"?	11:41:10
5	A. There might be a way of doing this.	11:41:10
6	Q. I'm not asking you if there might be other	11:41:12
7	ways; I'm asking, do you know that one way to do it	11:41:14
8	is an exclusive OR operation, right?	11:41:17
9	A. This might very well be true, yes.	11:41:19
10	Q. Okay. So when Dr. Divsalar testified in	11:41:23
11	this case that this performs an XOR operation, you	11:41:29
12	have no basis to disagree with him, do you?	11:41:33
13	A. If he says so, I believe him.	11:41:36
14	Q. Okay. So let's look at how each of the Y1	11:41:41
15	through YN subsets is calculated, okay?	11:41:46
16	Y1 is comprised of the subset X1, right?	11:41:54
17	MR. GLASS: Outside the scope.	11:41:57
18	THE WITNESS: Y1 simply takes the first	11:41:59
19	element and computes the sum.	11:42:02
20	BY MR. DOWD:	11:42:03
21	Q. Okay. Y2 is comprised of the subset X1	11:42:04
22	plus X2, right?	11:42:08
23	MR. GLASS: Same objection.	11:42:11
24	THE WITNESS: What this box does, it's an	11:42:13
25	accumulated and it computes mathematically whatever	11:42:16

1	an accumulator does. That's what it is. That's	11:42:19
2	what I can say.	11:42:20
3	BY MR. DOWD:	11:42:25
4	Q. Okay. Let me maybe come at this a	11:42:26
5	different way.	11:42:29
6	Take -- turn back to the '781 patent,	11:42:29
7	Exhibit 3, and turn to Column 3. And I'd like you	11:42:50
8	to read to yourself Lines 5 down to Line 24. Let me	11:42:59
9	know when you're done.	11:43:11
10	A. Are we talking about page -- Column 3?	11:43:12
11	Q. Column 3 from Line 5 where it begins:	11:43:16
12	"The accumulator" -- "accumulator may be a truncated	11:43:19
13	rate-1 recursive convolutional coder," all the way	11:43:23
14	down past the formula to Line 24.	11:43:28
15	A. I'm done.	11:44:27
16	Q. Okay. So this describes an accumulator,	11:44:29
17	right?	11:44:33
18	MR. GLASS: Objection. Outside the scope.	11:44:33
19	THE WITNESS: I have not -- you know, I	11:44:34
20	have not read this patent and tried to make an	11:44:36
21	analysis of it. I feel uncomfortable now making	11:44:38
22	on-the-spot judgment.	11:44:41
23	BY MR. DOWD:	11:44:41
24	Q. So when it says: "The encoder is an	11:44:43
25	accumulator," you don't know whether it's an	11:44:45

1	accumulator?	11:44:48
2	MR. GLASS: Same objections. Calls for a	11:44:48
3	legal conclusion.	11:44:50
4	THE WITNESS: Whatever is written here, I	11:44:50
5	don't doubt it, but I have not, you know, looked in	11:44:56
6	details about this thing. There is one thing to	11:44:59
7	think about what technically a word means. There's	11:45:02
8	another one legal means. I have no -- no idea, you	11:45:05
9	know, what exactly that would be defined and what	11:45:07
10	exactly that would mean in a legal way and there's	11:45:11
11	no way for me now on the spot to -- to answer this	11:45:14
12	question.	11:45:17
13	BY MR. DOWD:	11:45:19
14	Q. So in performing the analysis that you	11:45:19
15	have performed for this case, you have -- nothing	11:45:22
16	that you did allowed you to form an opinion about	11:45:28
17	whether the intercoder 206 in the '781 patent is an	11:45:31
18	accumulator?	11:45:36
19	A. I was not asked --	11:45:36
20	MR. GLASS: Same -- same objections. Go	11:45:36
21	ahead.	11:45:39
22	THE WITNESS: I was not asked to perform	11:45:39
23	an opinion on that.	11:45:41
24	BY MR. DOWD:	11:45:43
25	Q. Okay. So let me just ask you this. Do	11:45:43

1	you see where it says at Line 7:	11:45:45
2	"Such an accumulator may be considered	11:45:49
3	a block coder whose input block X sub one	11:45:51
4	through X sub N and output block Y sub one	11:45:55
5	through Y sub N are related by the	11:45:59
6	formula," and then it provides a formula?	11:46:02
7	A. I see that.	11:46:04
8	Q. That's the same description as Divsalar on	11:46:04
9	Page 5 where it says:	11:46:08
10	"The accumulator can be viewed as a	11:46:09
11	truncated rate-1 recursive convolutional	11:46:12
12	encoder with a transfer function, one over	11:46:14
13	one plus N, but we prefer to think of it	11:46:17
14	as a block code whose input block X sub	11:46:21
15	one through X sub N and output block Y sub	11:46:24
16	one through Y sub N are related by the	11:46:28
17	formula," and it provides a formula,	11:46:31
18	right?	11:46:33
19	MR. GLASS: Same objection. Outside the	11:46:33
20	scope. Calls for a legal conclusion.	11:46:34
21	THE WITNESS: There is some similarities	11:46:35
22	in language, some similarities in words, yes.	11:46:37
23	BY MR. DOWD:	11:46:41
24	Q. And the code -- the formula that's written	11:46:41
25	there is the same formula, right?	11:46:43