1 IN THE UNITED STATES DISTRICT COURT
2 EASTERN DISTRICT OF TEXAS
3 MARSHALL DIVISION
4
5 ENTROPIC COMMUNICATIONS, LLC,)
Plaintiff,)
6) Case No.:
vs.) 2:22-cv-00125-JRG
7)
CHARTER COMMUNICATIONS, INC.,)
8 Defendants.)
_____)
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13
14 VIDEO-RECORDED REMOTE DEPOSITION OF
15 TIMOTHY GALLAGHER
16 Woodinville, Washington
17 Wednesday, July 19, 2023; 8:36 a.m.
18
19
20
21
22 REPORTED BY:
23 Victoria A. Guerrero, CSR, RDR, RMR, CRR
24 Job No. 6018492
25 Pages 1 through 59

ENTROPIC EXHIBIT 2005
Cox v. Entropic
IPR2024-00578

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Plaintiff,)
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7)
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8 Defendants.)
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15 BE IT REMEMBERED that, pursuant to Federal
16 Rules of Civil Procedure, the deposition of TIMOTHY
17 GALLAGHER was taken before Victoria A. Guerrero,
18 California Certified Shorthand Reporter, Registered
19 Diplomate Reporter, Registered Merit Reporter, and
20 Certified Realtime Reporter, on Wednesday, July 19,
21 2023, commencing at the hour of 8:36 a.m., the
22 witness responding to questions by videoconference
23 from Woodinville, Washington; the questions being
24 propounded and proceedings reported remotely via
25 videoconference.

1 R E M O T E A P P E A R A N C E S:
2
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15
16
17 ALSO PRESENT:
18 Terry Weiss, Videographer
19 Jake Franks, Concierge tech
20
21
22
23
24
25

1 Wednesday, July 19, 2023; 8:36 a.m.
2 Woodinville, Washington
3 ooOoo
4 THE VIDEOGRAPHER: Good morning. We are 08:36:20
5 on the record at 8:36 a.m. on July 19, 2023. 08:36:20
6 Audio and video recording will continue to take 08:36:26
7 place unless all parties agree to go off the 08:36:30
8 record. The quality of the recording depends 08:36:32
9 on the quality of the camera, of the witness, 08:36:34
10 and the internet connection of the 08:36:37
11 participants. 08:36:38
12 This is the video-recorded deposition of 08:36:39
13 Timothy Gallagher in the matter of Entropic 08:36:41
14 Communications vs Charter Communications filed 08:36:46
15 in the United States District Court, Eastern 08:36:48
16 District of Texas. Case No. 2:22-cv-00125. 08:36:50
17 This deposition is being held via Zoom 08:36:58
18 remote meeting. My name is Terry Weiss from 08:37:01
19 the firm of Veritext Legal Solutions and I'm 08:37:04
20 the videographer. Our court reporter today is 08:37:08
21 Victoria Guerrero from the firm of Veritext 08:37:10
22 Legal Solutions. 08:37:12
23 I am not related to any party in this 08:37:12
24 action, nor am I financially interested in the 08:37:15
25 outcome. Counsel and everyone attending 08:37:17

1 remotely will now state their appearances and 08:37:20
2 affiliations for the record. If there are any 08:37:22
3 objections to proceeding, please state them at 08:37:24
4 the time of your appearance beginning with the 08:37:27
5 noticing attorney. 08:37:30
6 MR. COHN: This is Marc Cohn with Arnold & 08:37:31
7 Porter in Washington DC for the defendant. 08:37:33
8 MS. ALLOR: Katie Allor from K & L Gates 08:37:38
9 on behalf of plaintiff Entropic Communications, 08:37:41
10 LLC. 08:37:42
11 THE VIDEOGRAPHER: Will the court reporter 08:37:45
12 please swear in the witness. 08:37:45
13 ooOoo 08:37:46
14 Whereupon, TIMOTHY GALLAGHER, having first 08:37:46
15 been sworn by the California Certified 08:37:46
16 Shorthand Reporter, testified under oath as 08:37:46
17 follows: 08:37:46
18 08:37:46
19 EXAMINATION 08:37:47
20 08:37:47
21 BY MR. COHN: 08:38:02
22 Q Good morning, Mr. Gallagher. 08:38:05
23 A Good morning. 08:38:06
24 Q Thank you for being with us today. 08:38:06
25 Have you given deposition testimony before? 08:38:08

1 everybody. Are you currently on any medication or 08:40:13
2 is there any reason why you couldn't give complete 08:40:15
3 and accurate testimony today? 08:40:18
4 A No. 08:40:26
5 Q Who do you currently work for? 08:40:27
6 A Amazon. 08:40:30
7 Q And how long have you worked there? 08:40:30
8 A Almost four years. It was August 2019. 08:40:33
9 Q And what do you do for Amazon? 08:40:39
10 A I'm an engineering manager on a project 08:40:42
11 where we're developing an integrated circuit for 08:40:45
12 satellite communications. 08:40:53
13 Q Are you involved in any DOCSIS-compliant 08:40:59
14 systems-on-chip in your work at Amazon? 08:41:05
15 A No. 08:41:07
16 Q Before you went to Amazon in August of 08:41:07
17 2019, where did you work? 08:41:09
18 A MaxLinear. 08:41:12
19 Q When did you start there? 08:41:15
20 A It was -- I believe it was December of 08:41:24
21 2009. 08:41:26
22 Q Why did you leave MaxLinear? 08:41:27
23 A Well, I got the opportunity, I was 08:41:30
24 contacted by a recruiter, and Amazon is working on 08:41:35
25 this big satellite project, sort of a ground-up, new 08:41:37

1 field. And it sounded interesting and exciting. So 08:41:42
2 I decided -- I had been at MaxLinear quite some 08:41:48
3 time, so decided to try something new. 08:41:50
4 Q At the time that you left MaxLinear, was 08:41:53
5 MaxLinear's business declining in terms of annual 08:41:55
6 revenue? 08:41:58
7 MS. ALLOR: Objection. Form. 08:42:03
8 THE WITNESS: I don't think so -- oh, 08:42:04
9 sorry. I don't think so. They were -- they 08:42:06
10 had been for some time buying up other 08:42:08
11 companies. So the overall income was going up, 08:42:11
12 as I recall. I mean, it's always bumpy, but in 08:42:15
13 general, going up. 08:42:19
14 BY MR. COHN: 08:42:24
15 Q When you left MaxLinear, what was your 08:42:24
16 title? 08:42:26
17 A Vice president of the communications 08:42:27
18 systems group. 08:42:28
19 Q How long did you have that title at 08:42:38
20 MaxLinear? 08:42:39
21 A Don't remember exactly. Quite a while. 08:42:41
22 Probably, I don't know, maybe 2013, '14, something 08:42:47
23 like that. 08:42:51
24 Q What was your title previous to that? 08:42:52
25 A I don't recall, to be honest. Director? 08:42:56

1 Probably was director. 08:42:59
2 Q Were you involved in the communications 08:43:00
3 systems group throughout your entire time at 08:43:02
4 MaxLinear? 08:43:05
5 A Yes. Yes. Pretty much. 08:43:06
6 Q Before MaxLinear, where did you work? 08:43:11
7 A I worked at a company called Staccato 08:43:14
8 Communications. They were developing integrated 08:43:19
9 circuits for ultra wideband, a market that never 08:43:23
10 really happened, but it was kind of big at the time. 08:43:26
11 Q Did it involve communications over a cable? 08:43:32
12 A It primarily was wireless, but I think we 08:43:41
13 did look into some applications over cable. 08:43:44
14 Q Sorry. Go ahead. 08:43:49
15 A Yeah. It wasn't the main market. Main 08:43:51
16 market was short-range wireless communication. 08:43:53
17 Q What do you mean by ultra wideband? 08:43:55
18 A The FCC back -- I forget exactly when. 08:43:59
19 They allocated spectrum from something like 3 to 08:44:02
20 10 gigahertz for short-range communications if you 08:44:07
21 avoided interfering with other systems and 08:44:10
22 transmitted at a very low power. 08:44:14
23 So the concept was you could do things -- 08:44:17
24 well, at the time Wi-Fi was quite slow. And the 08:44:21
25 concept was you would do this ultra wideband for 08:44:26

1 much higher data rate, short-range communication. 08:44:29
2 Q Did you work on any DOCSIS- or 08:44:33
3 MoCA-compliant development work when you were at 08:44:35
4 Staccato? 08:44:37
5 A No. 08:44:39
6 Q Was the first time that you were involved 08:44:40
7 in DOCSIS- or MoCA-compliant devices when you were 08:44:41
8 at MaxLinear? 08:44:48
9 A Yes. Yes, it was. 08:44:49
10 Q Where did you work before Staccato? 08:45:04
11 A A company called Entropic Communications. 08:45:07
12 They were doing something called LMDS, wireless 08:45:12
13 communications for things like T1 phone lines to 08:45:16
14 businesses and that sort of thing. So over several 08:45:22
15 kilometers you would have a microwave link to 08:45:27
16 provide data and phone services to businesses. 08:45:30
17 Q And roughly when were you at Entropic 08:45:33
18 Communications? 08:45:36
19 A Entropic. No. It was -- Ensemble is what 08:45:41
20 it was called. 08:45:45
21 Q Okay. 08:45:46
22 A Yeah. There was an Entropic also right 08:45:46
23 down the street, but I never actually worked for 08:45:50
24 them. I was at Ensemble from 1999 to about 2004, as 08:45:53
25 I recall. 08:45:59

1 Q And before Ensemble? 08:46:04
2 A I worked for Hughes. Hughes Aircraft. 08:46:08
3 Q And before that? 08:46:23
4 A Before that I was in school. I worked at 08:46:23
5 my dad's gas station. I don't know if you need 08:46:25
6 that. 08:46:29
7 Q What degrees do you have? 08:46:30
8 A A bachelor's in electrical engineering and 08:46:33
9 computer science and then I have a master's in EE, 08:46:36
10 with an emphasis on single processing. 08:46:40
11 Q Are you a named inventor on patents? 08:46:55
12 A Yes, on several. 08:46:58
13 Q Do you know roughly how many? 08:46:59
14 A I meant to look that up yesterday. I don't 08:47:00
15 know how many. I would guess on the order of a 08:47:02
16 dozen maybe, something like that. 08:47:06
17 Q What did you do to prepare for today's 08:47:20
18 deposition? 08:47:22
19 A I read the patent, I read the three 08:47:22
20 patents. That's really all I did. 08:47:26
21 Q Did someone give you three patents to read? 08:47:34
22 A I talked to -- was it Albert, I think? He 08:47:37
23 gave me the three -- 8,792,008 and 9,825,826 and 08:47:40
24 10,135,682. So those are the three I looked at. 08:47:48
25 Q Other than discussions with -- was it Al 08:48:06

1 getting pulled into this or not? And he said yes. 08:51:02
2 But that was about the end of it. 08:51:04
3 We didn't talk about any -- anything of 08:51:06
4 substance in terms of what's in the patent or not in 08:51:10
5 the patent. 08:51:12
6 Q And you didn't talk to Dr. Ramesh since his 08:51:14
7 deposition about how it went? 08:51:17
8 A I'm trying to remember. No, I haven't 08:51:28
9 talked to him since then. 08:51:29
10 Q I deposed him just last week so it would 08:51:31
11 have been in the last few days. 08:51:32
12 A I talked to him -- I probably talked to him 08:51:32
13 back in April or May. 08:51:34
14 Q Okay. Anyone else that you talked to 08:51:35
15 relating to this case besides these people? 08:51:37
16 A I mentioned it to my wife. 08:51:40
17 Q Let's start with the document stamped 08:52:16
18 Gallagher Exhibit 1 which is US Patent 9,825,826. 08:52:18
19 (Exhibit 1, US Patent 9,825,826, was 08:52:30
20 marked.) 08:52:30
21 BY MR. COHN: 08:52:31
22 Q Let me know when you have that up on your 08:52:32
23 screen? 08:52:34
24 A Is it going to show up in some window or 08:52:34
25 something? 08:52:35

1 Q If you click on it there's a little delay 08:52:36
2 but then it should pop up. 08:52:38
3 A I do have that patent open in another 08:52:42
4 window. Do I have to use the one that you sent me? 08:52:44
5 Q No. As long as it's the complete patent. 08:52:46
6 A Okay. So the '826 one, right? 08:52:50
7 Q 9,825,826 B2. 08:52:55
8 A Okay. I have it. 08:52:59
9 Q You're the first listed inventor on this 08:53:03
10 patent? 08:53:05
11 A Correct. 08:53:06
12 Q Do you remember the work you did that led 08:53:12
13 to this patent? 08:53:13
14 A This one, as I recall, is sort of a 08:53:14
15 follow-on to the prior '008. 08:53:16
16 Q Okay. Let's go to the '008 first, then, 08:53:23
17 and we'll talk in the context of that one. And I 08:53:25
18 marked that as Gallagher Exhibit 2. Which, for the 08:53:28
19 record, is US Patent No. 8,792,008 B2. Let me know 08:53:31
20 when you have that in front of you. 08:53:38
21 (Exhibit 2, US Patent 8,792,008 B2, was 08:53:42
22 marked.) 08:53:42
23 THE WITNESS: I have it. 08:53:43
24 BY MR. COHN: 08:53:44
25 Q With respect to the '008, do you recall the 08:53:44

1 work that you did that led to this patent? 08:53:47
2 A It's not crystal clear. This was, like, 08:53:53
3 close to a decade or so ago. But kind of what I 08:53:55
4 remember is we were working on these wideband tuners 08:53:58
5 that can capture -- digitize a whole cable spectrum. 08:54:05
6 Patrick Tierney was the -- more the 08:54:10
7 marketing guy. And I believe he had talked to some 08:54:13
8 of the people who had -- were involved in, like, 08:54:16
9 what it took to maintain a cable network in the 08:54:21
10 field and how difficult and expensive it was. And 08:54:25
11 so he had mentioned that to myself. 08:54:30
12 And so Jun Huang and I, as I recall, we 08:54:34
13 were thinking, we've digitized all this data 08:54:39
14 already, we already have it inside the chip, is 08:54:42
15 there something we can do to provide information to 08:54:45
16 the network about the quality of the signal that's 08:54:49
17 coming into the cable modem. 08:54:55
18 And so we, you know, we already had concept 08:54:57
19 of a channelizer and we had, you know, circuits to 08:55:01
20 measure power and demodulate signals. And so we 08:55:08
21 thought okay, we can -- we have a lot of this stuff 08:55:11
22 here, why don't we apply, like, one more channelizer 08:55:13
23 path to do things like monitor the spectrum, power, 08:55:19
24 you know, basically the quality of a particular 08:55:23
25 channel. And you could switch it between several -- 08:55:26

1 several channels if you wanted to. So that was the 08:55:31
2 idea. 08:55:34
3 Q The idea was to send information from the 08:55:44
4 receiver back to the network about a particular 08:55:47
5 channel in the spectrum? 08:55:51
6 A And it could be -- let's say you're 08:55:52
7 using -- let's say there's a TV channel, you're 08:55:56
8 watching a particular channel. In parallel you 08:56:00
9 could have this monitoring circuit, if you want to 08:56:03
10 call it, check other channels that you're, boom, 08:56:12
11 happen to be using at that instant in time. And 08:56:14
12 that could be sort of happening in parallel in 08:56:17
13 background. 08:56:20
14 The idea is you could be sending that 08:56:20
15 information to the network all the time. And if you 08:56:22
16 have this deployed in many cable modems then the 08:56:25
17 network would get information about their, you know, 08:56:29
18 distributed cable system in real-time and in many -- 08:56:32
19 from many cable modems. 08:56:43
20 Q This patent talks about something called a 08:56:45
21 channelizer. What's your understanding of what a 08:56:47
22 channelizer is in the context of this patent? 08:56:50
23 A So in the cable spectrum the signal is sent 08:56:54
24 down the cable. There is typically on the order of 08:56:58
25 1 gigahertz of information. And it's separated 08:57:01

1 into, in the US, typically, 6-megahertz-wide 08:57:05
2 channels. And a channel can be carrying television 08:57:09
3 content or it could be data like in DOCSIS. 08:57:12
4 So you have on the order several hundred of 08:57:17
5 these channels that are frequency-division 08:57:19
6 multiplexed together. So, you know, one, let's say, 08:57:22
7 from 100 meg to 106, and the next one from 106 to 08:57:24
8 112, and so on, all the way up to, like, 1 08:57:30
9 gigahertz. 08:57:32
10 So the purpose of a channelizer is to pick 08:57:33
11 out -- this is digital signal processing, because 08:57:37
12 we've digitized the entire spectrum. So we have a 08:57:40
13 digital signal processor to select a particular 08:57:43
14 channel and process the information carried in that 08:57:47
15 signal. 08:57:52
16 Q You said that two things were happening. 08:57:53
17 You used the phrase "in parallel" with respect to 08:57:59
18 the concept in the patent. 08:58:02
19 What were you referring to there? 08:58:04
20 A Right. So you can -- you can have a single 08:58:07
21 digital signal processing path that picks out a 08:58:11
22 single channel and, let's say, uses it, demodulates 08:58:15
23 it, and creates a television signal. Right? 08:58:19
24 You can have on the same integrated circuit 08:58:23
25 a second channelizing circuit that could then go to 08:58:25

1 the -- let's call it the monitoring function. Or 08:58:31
2 you could have three or four, however many. 08:58:37
3 I mean, it's essentially you can add into 08:58:39
4 the integrated circuit as many as you -- well, I 08:58:42
5 mean, there's cost there. It costs (unintelligible) 08:58:46
6 to put them there. 08:58:51
7 But with modern integrated circuits it's, 08:58:52
8 you know, relatively inexpensive to add a second or 08:58:54
9 third or, let's say, a monitoring channel. 08:58:58
10 Q So that the monitoring and the data 08:59:02
11 processing would occur at the same time, is that 08:59:03
12 what you mean by "in parallel"? 08:59:07
13 A Yeah. Exactly. That's what I mean, in 08:59:09
14 parallel. 08:59:11
15 Q Now, if you look at -- if you look at Claim 08:59:24
16 1 of the '008 patent, that's on the last page of the 08:59:40
17 patent. 08:59:46
18 A Yes. Got it. 08:59:53
19 Q Do you see in Claim 1 it talks about 08:59:55
20 reporting a determined characteristic to a source of 08:59:59
21 the received signal, at about lines 23 and 24? 09:00:03
22 A Analyze said digital signal to determine a 09:00:11
23 characteristic and reports -- yeah, right. Got it. 09:00:14
24 Q That claim doesn't limit what the 09:00:17
25 determined characteristic is, right? 09:00:20

1 It could be any characteristic of the 09:00:22
2 channel being analyzed; is that right? 09:00:25
3 A That's right. Yeah. I sometimes have a 09:00:28
4 hard time deciphering what the lawyers did to what I 09:00:34
5 wrote; but yeah, you're right. It doesn't limit 09:00:37
6 them. 09:00:40
7 Q And it doesn't say in Claim 1 what the 09:00:40
8 source of the received signal will do with the 09:00:44
9 information reported to it; is that right? 09:00:49
10 A That, I believe, is correct, yes. 09:00:58
11 Q Did MaxLinear have software in place that 09:01:10
12 would use the characteristics that were reported 09:01:17
13 back to the headend? 09:01:25
14 MS. ALLOR: Object to the form. 09:01:32
15 THE WITNESS: No. At that time MaxLinear 09:01:36
16 was strictly in the cable modem side of the 09:01:37
17 business so they didn't have software running 09:01:41
18 on the CMTS or the headend. 09:01:44
19 We had software running in our chip to 09:01:48
20 measure these things, like signal power and 09:01:51
21 spectrum and stuff like that, and format that 09:01:54
22 data so that it could be sent. But we didn't 09:01:58
23 have software running in the headend. 09:02:00
24 BY MR. COHN: 09:02:04
25 Q So MaxLinear made a system-on-chip that was 09:02:05

1 capable of reporting characteristics of a channel 09:02:08
2 back to the CMTS or the headend; is that right? 09:02:11
3 MS. ALLOR: Objection to form. 09:02:15
4 THE WITNESS: That's correct, yeah. 09:02:17
5 BY MR. COHN: 09:02:19
6 Q And did the providers at the CMTS at the 09:02:19
7 headend have their own software that would then 09:02:25
8 process that information in some way? 09:02:27
9 MS. ALLOR: Objection to form. 09:02:30
10 THE WITNESS: I believe so, yes. Or at 09:02:31
11 least -- I don't know if they had it at the 09:02:32
12 time we filed for the patent, but over time 09:02:35
13 that became true, yeah. 09:02:41
14 BY MR. COHN: 09:02:44
15 Q As far as you know, was the MaxLinear -- 09:02:45
16 was MaxLinear the first one to make a system-on-chip 09:02:50
17 that would report characteristics of the signal back 09:02:54
18 to the headend? 09:02:57
19 A I don't know for sure. I don't know. I 09:03:00
20 know, like, the tuners that we had at MaxLinear had 09:03:07
21 done in prior, you know, prior to this were quite a 09:03:09
22 bit simpler and did not have those sorts of 09:03:12
23 functions. But I don't know if other companies, you 09:03:15
24 know, had come up with this sort of idea earlier or 09:03:17
25 not. 09:03:24