

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT TRIAL AND APPEAL BOARD

DISH NETWORK L. L. C.,

Petitioner,

v.

ENTROPIC COMMUNICATIONS,
LLC,

Patent Owner.

CASE: 1PR2024-00373

U. S. PATENT NO. :
7,594,249

DEPOSITION OF REGIS J. BATES, JR.

Heber, Arizona
January 7, 2025
9:19 a.m.

REPORTED BY:
Kate E. Roundy, RPR
Arizona Certified Reporter
Certificate No. 50582

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

I N D E X

WITNESS	PAGE
REGIS J. BATES, JR.	
EXAMINATION BY MR. PIROUZNIA	5
EXAMINATION BY MR. HALVERSON	206

* * * * *

E X H I B I T S

(No new exhibits were marked.)

(The following exhibits were previously marked
for identification and referred to herein.)

NO.	PAGE
Exhibit 1001	124
Exhibit 1005	196
Exhibit 1007	201
Exhibit 2007	7
Exhibit 2012	117

* * * * *

1 THE DEPOSITION OF REGIS J. BATES, JR., commenced
2 at 9:19 a.m. on January 7, 2025, at Best Western Sawmill
3 Inn, 1877 Highway 260, Heber, Arizona 85928, before
4 KATE E. ROUNDY, RPR, a Certified Court Reporter,
5 Certificate No. 50582, for the State of Arizona.

6
7
8 APPEARANCES:

9 For the Petitioner:

10 FISH & RICHARDSON P. C.
11 By: Aaron Pirouznia, Esq.
12 1717 Main Street, Suite 5000
13 Dallas, Texas 75201
14 (214) 292-4073
15 pirouznia@fr.com

16 FISH & RICHARDSON P. C.
17 By: Alyaman Amer, Esq.
18 111 Congress Avenue, Suite 2000
19 Austin, Texas 78701
20 (214) 292-4043
21 amer@fr.com
22 (Appearing via Zoom videoconference)

23 For the Patent Owner:

24 K&L GATES LLP
25 By: Erik J. Halverson, Esq.
26 4 Embarcadero Center, Suite 1200
27 San Francisco, California 94111
28 (415) 882-8238
29 erik.halverson@klgates.com

30 K&L GATES LLP
31 By: Joshua Andrews, Esq.
32 1 Congress Street, Suite 2999
33 Boston, Massachusetts 02114
34 (617) 951-9076
35 joshua.andrews.klgates.com

1 APPEARANCES
2 (CONTINUED):

3 For the Defendant DirecTV:

4 FINNEGAN HENDERSON FARABOW GARRETT & DUNNER
5 By: Victor Palace, Esq.
6 901 New York Avenue, NW
7 Washington, DC 20001-4413
8 (202) 408-4117
9 victor.palace@finnegan.com
10 (Appearing via Zoom videoconference.)
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

* * * * *

1

Heber, Arizona
January 7, 2025
9:19 a.m.

2

3

4

REGIS J. BATES, JR. ,

5

called as a witness herein, having been duly sworn by the

6

Certified Court Reporter, was examined and testified as

7

follows:

8

9

EXAMINATION

10

BY MR. PIROUZNIA:

11

Q. Good morning, Mr. Bates.

12

A. Good morning.

13

Q. Please state your name for the record.

14

A. My legal name is Regis J. Bates, Jr. However, I
go by "Bud. "

15

16

Q. Thank you. You can --

17

THE COURT REPORTER: Can we hang on for a second,
please?

18

19

(Discussion off the record.)

20

BY MR. PIROUZNIA:

21

Q. You've been deposed before; correct?

22

A. I have.

23

Q. Approximately how many times?

24

A. Oh, approximately 40 to 45.

25

Q. Do you understand that you are giving sworn

1 testimony under oath today?

2 A. I do.

3 Q. Is there any reason that you cannot testify
4 truthfully and accurately today?

5 A. No reason whatsoever.

6 Q. If you don't understand a question I ask, will
7 you let me know?

8 A. I will.

9 Q. If you answer the question I have asked, I will
10 assume you understood the question.

11 Is that fair?

12 A. Yes.

13 Q. Your attorney may object to some questions. If
14 that happens, I will expect you to answer unless you've
15 been specifically instructed not to the answer.

16 Do you understand?

17 A. I understand.

18 Q. Let me know if you need a break, and we can take
19 one. You must answer any question that may be pending
20 before we take a break.

21 Do you understand?

22 A. I do.

23 Q. In this IPR proceeding you submitted an expert
24 declaration containing your opinions; right?

25 A. Correct.

1 Q. We've previously marked that as Exhibit 2007 in
2 the proceeding, so we'll just use that same exhibit number
3 in this deposition.

4 And I believe you have a copy of that in
5 volume 2.

6 A. I have.

7 Q. Great.

8 Am I correct that you thoroughly reviewed this
9 declaration in preparation for your deposition today?

10 A. I did.

11 Q. Do you still stand behind all the opinions you
12 offered in your declaration?

13 A. I do.

14 Q. Since submitting the declaration, did you notice
15 any substantive errors, mistakes, or opinions you'd like
16 to change or withdraw?

17 A. I have two.

18 Q. Can you please list those for us.

19 A. The first one is on paragraph 52 -- I'm sorry.
20 Just a minute. It's 57; paragraph 57.

21 Q. Okay. I'm there.

22 And what is the error you noticed on that?

23 A. Paragraph 57, the second -- the beginning of the
24 second line, it relates to the 249 patent as of May 4. It
25 says 2021. I'd like to change that to 2001.

1 Q. Understood.

2 And where was the second error, Mr. Bates?

3 A. Paragraph No. 220, I noticed that I had reversed
4 a couple of numbers here. The second line again -- I'll
5 read the whole paragraph. It says, As described in the
6 DSL book, ADSL provided throughput at a rate of 1.44 --
7 1.544 megabits in the upstream and 16 to 64 kilobits in
8 the downstream.

9 Those numbers should be reversed. The downstream
10 would be 1.544 megabits. The upstream would be 16 to
11 64 kilobits.

12 I think those are the only two I found.

13 Q. So other than the two errors on paragraphs 57 and
14 220, you didn't notice any other mistakes or opinions
15 you'd like to change or withdraw in your declaration;
16 right?

17 A. Correct.

18 Q. Did you prepare for today's deposition?

19 A. I did.

20 Q. When was that?

21 A. I beg your pardon?

22 Q. When did you prepare?

23 A. Oh, yesterday and the day before yesterday.

24 Q. With whom did you prepare in the past two days?

25 A. Well, the day before yesterday I used my own time

1 and I was reading -- rereading through my declaration and
2 some of the referenced article -- art.

3 Yesterday I met with counsel for about two hours.

4 Q. Other than counsel, did you speak with anyone to
5 prepare for today's deposition?

6 A. No.

7 Q. So I'd first like to ask you a bit about your
8 technical background and experiences leading up to your
9 retention in this case.

10 A. Sure.

11 Q. And first I'd like to just start with some
12 communication concepts generally.

13 Is that all right?

14 A. (Nonverbal response.)

15 Q. All right. What is a LAN?

16 A. LAN is defined as a local area network, which is
17 a series of devices, whether the terminal, servers,
18 whatever, printers, that are all interconnected with a
19 cable system of some sort -- or it could be wireless. I
20 don't want to limit it to a cable system -- in which
21 people can communicate between each other or back and
22 forth to the servers and the printers.

23 If I can continue just a second.

24 A LAN is usually geographically bounded by --
25 normally we refer to it as within a mile.

1 Q. Why a mile?

2 A. Well, the cables -- when we first started using
3 local area networks, we used a technique called Ethernet,
4 and the Ethernet would allow me to put a couple of
5 repeaters in to extend the cable up to a mile. And that's
6 why we bind it by -- or bound it.

7 Q. And what is a WAN, W-A-N?

8 A. The wide area network really encompasses anything
9 beyond or outside the scope of the local area network, if
10 you will. We typically define the POTS, the plain old
11 telephone service, or the PSTN, the public switch
12 telephone network, would incorporate the WAN.

13 Q. And how is a LAN different than a WAN?

14 MR. HALVERSON: Objection. Form.

15 THE WITNESS: The WAN is going to be, again,
16 bounded by the one-mile limitation. It could be smaller
17 than that. It could be just a department. It could be a
18 building or whatever.

19 But the LAN is going to be associated within
20 local communications in itself.

21 The WAN, I'm going external to the LAN, so as a
22 result, we -- we can either have point-to-point circuits.
23 We could have dial-up communications. We can have some
24 form of a packet switch network. There's a couple of
25 different ways we could do that.

1 BY MR. PIROUZNIA:

2 Q. So I want to break that down a little bit.

3 You first started with the geographic
4 differences, I think, between a local area network and a
5 wide area network; right?

6 A. Correct.

7 Q. Is that where the terminology comes from as far
8 as local versus wide area is based on the geographic area
9 you're dealing with?

10 A. That's typically what the communications networks
11 define it as.

12 Q. And you mentioned some different -- I'll say
13 technologies that you might use in a LAN versus a WAN like
14 the packet switching and the, you know, POTS; right?

15 A. Yes.

16 Q. Is it possible to have a LAN and a WAN that each
17 use the same equipment, but one is used as a WAN and one
18 is used as a LAN?

19 MR. HALVERSON: Objection. Form.

20 THE WITNESS: You'd have to really be -- think
21 about what you're talking there.

22 Within the LAN I'm going to have switches and
23 devices that are going to communicate within terminal
24 devices within that same geographic-bounded area.

25 When I go to the WAN, I'm going to go outside, so

1 I'm going to have to use something that connects me to the
2 WAN. So the LAN can connect to the WAN through devices
3 like gateways, routers, switches, things of that nature.

4 We typically don't use the same exact systems in
5 a LAN and a WAN.

6 BY MR. PIROUZNIA:

7 Q. So I think you mentioned we might have different
8 equipment in a WAN versus a LAN as far as the switches and
9 so forth; right?

10 A. Correct.

11 Q. What about the cabling?

12 Would we see a difference in cabling between a
13 typical LAN and a typical WAN?

14 A. Well, that's kind of like a very -- a very large
15 answer.

16 Q. Sure.

17 A. But effectively, if I'm dealing with a local area
18 network -- I mentioned I could have a wireless local area
19 network standard 802.11 IEEE standard. I could have an
20 Ethernet cable, which is a coaxial cable. I could have a
21 broadband cable, and I've installed many of those in a LAN
22 environment, typically like an IBM dual cable system.

23 Wang had a broadband cable system where I was
24 hooking up my local area network devices on a high-speed
25 communication system.

1 When I go to the outside world, there is the
2 cable teleph- -- excuse me -- cable TV-type systems that
3 we use where we use a coaxial cable coming into a
4 customer's building.

5 However, normally within the wide area network
6 we're probably going to use some form of a twisted pair or
7 an optical cable, a microwave radio, a satellite terminal,
8 something to that nature because we're covering much, much
9 broader areas.

10 Q. That was a little bit of a lengthy answer, so I
11 want to break it down a little bit, if that's okay.

12 You mentioned Ethernet, and that's a type of
13 coaxial cable; right?

14 A. Correct.

15 Q. Do you consider Ethernet a type of coaxial cable
16 because it involves a conductor surrounded by a shield?

17 A. The original Ethernet uses a coaxial cable, which
18 was a baseband cable, not a broadband cable.

19 We put the signal onto it and we directly
20 modulate the signal or use a Manchester encoding
21 capability to broadcast a signal down that coaxial cable.

22 And, yes, we would have a center conductor and we
23 would have an outer conductor.

24 Q. Okay. You said the original Ethernet.

25 What are you referring to as the original

1 Ethernet?

2 A. When Ethernet was first created, we used coaxial
3 cable. We have since evolved to an unshielded twisted
4 pair wiring system.

5 Q. The unshielded twisted pair that we currently
6 use, do you consider that a coaxial cable?

7 A. No.

8 Q. And you said the original Ethernet did use a
9 coaxial cable; right?

10 A. Correct.

11 Q. What type of coaxial cable was that?

12 A. It was a baseband cable -- a coaxial cable that
13 only carried the one transmission down the wire. You
14 speak, I listen. I speak, you listen. And that was the
15 way Ethernet worked.

16 Q. Your earlier answer also mentioned a broadband
17 cable. I believe you mentioned IBM and Wang; is that
18 right?

19 A. IBM had a dual coax system.

20 Q. Okay.

21 A. Wang had a broadband dual coax system that was
22 used in -- internally within a company's network.

23 Q. Are either of those, IBM or Wang systems, the one
24 you referred to previously as the original Ethernet?

25 A. No.

1 Q. Who created the original Ethernet over coax?

2 A. A gentleman by the name of Bob Metcalfe actually
3 came up with the concept of Ethernet, and then primarily
4 the company that kind of really pushed it out was Digital
5 Equipment Corporation, and then others, of course,
6 followed suit.

7 Q. And when was that first Ethernet created by Bob
8 Metcalfe?

9 A. A long time ago. I don't remember the exact
10 dates, but it dates back to, you know, probably in the
11 '70s.

12 Q. Were the IBM and Wang systems you mentioned also
13 in the '70s?

14 A. I think Wang came along toward the later part of
15 the '70s. IBM had their system around the same time.

16 Q. Now, one of those systems you mentioned worked
17 where one device transmits, the other listens, and then
18 the second device transmits, and the first device listens;
19 right?

20 A. Correct.

21 Q. So the two devices cannot communicate at the same
22 time; right?

23 A. On that Ethernet when we first put it in -- on
24 that coax one device could transmit at a time. So I had
25 to listen before I could transmit. Once I sent the data,

1 I had to listen to make sure it made it all the way down
2 to the receiving device or to the end of the cable so that
3 there were no collisions. A collision could happen. If
4 two people listened at the same time and tried to
5 communicate at the same time, we'd create a collision.

6 A collision, of course, corrupts data. So what
7 we had to do was we would have to notify the whole
8 network, hey, we just had a collision. Back off. And
9 then we would do a back-off, wait a period of time, and
10 then try to communicate a second time.

11 Q. Would I be correct to refer to that type of
12 system as a time division multiplexing system?

13 A. It's called carrier-sense multiple access with
14 collision detection, CSMA/CD. In a way it's a timing
15 window, but it is unique in the way it works with the
16 CSMA/CD.

17 Q. So I want to make sure I got that acronym right.
18 You said carrier-sense multiplex --

19 A. Multiple access.

20 Q. Carrier-sense multiple assess...

21 A. With collision detection.

22 Q. And do you consider that a form of TDM or not?

23 A. Not really.

24 Q. Why not?

25 A. Because I'm only using -- one user can transmit

1 at a time, and it's not just between one to one. It's one
2 to whomever I want to communicate to. So it is a
3 different concept.

4 Q. So when you consider TDM, is it typically only
5 between two devices?

6 A. No. That isn't what I said.

7 Time division multiplexing is a multiplexing
8 scheme.

9 One of the earlier corrections I made, I talked
10 about a downstream at 1.544 megabits per second. Back in
11 the '60s we designed a time division multiplexing
12 capability called T1. A T carrier level 1 is
13 1.544 megabits per second.

14 Now, that's a multiplexing scheme, so what we do
15 is we take the full bandwidth of 1 and a half megabits and
16 we divide it up into slots, and then with those slots we
17 allocate that to users. So I and you would be able to
18 communicate.

19 It's a duplex service, so it is a 1.5 up and a
20 1.5 down. So we can speak to each other using that time
21 division multiplexing.

22 Counsel next to me might be talking to Kate here,
23 and they would have separate slots. They would be in slot
24 No. 2. They get their time allocation.

25 And typically, we use a network clocking scheme

1 of 8,000 cycles per second, or an 8 kilohertz clock. So
2 everything is timed perfectly for them to be able to speak
3 within their own slot, and there'd be no overlap.

4 But now I've got two people talking to each other
5 and two other people. And I could have up to 24 channels
6 on that T1, so I could have 24 simultaneous conversations
7 in their own time slots, if you will, taking place between
8 the two -- the different parties.

9 Q. And so if we circle back to the reason why you
10 said the original Ethernet is not a TDM system, can you
11 remind me how that differs?

12 A. I'm talking across the whole network within just
13 my time slot, but I'm not necessarily talking to the same
14 person every time. I could transmit first to the server.
15 The next transmission could be to a printer or whatever.

16 I'm given a time allocation based on the
17 carrier-sense multiple access with collision detection
18 capability, the CSMA/CD -- sorry -- but I'm given that
19 time to be able to transmit, but I'm not necessarily
20 talking to a specific person. I could be talking one to
21 one or one to many.

22 Q. And so is the one to one or one to many
23 differentiator what causes the CSMA/CD to not be a TDM
24 method, in your mind?

25 A. Well, again, I'm not multiplexing. I get my time

1 on that cable. Then I stop transmitting. Somebody else
2 transmits. Somebody else transmits. But we're not doing
3 it the same way as a multiplexing where I'm putting
4 multiple people on that one piece of bandwidth. I'm
5 putting one at a time.

6 Q. I guess I'm still not quite following why that's
7 different.

8 So in the CSMA/CD method you're given a set time
9 period to transmit, and that's the only time you're using
10 the cable; right?

11 A. I am allowed to transmit when nobody else is
12 transmitting.

13 Q. Right.

14 And that's delineated by a specific time period;
15 right?

16 A. The time is that there's nothing else on the
17 wire. So I'm not given a specific time every time to
18 transmit. I have to listen first, make sure nobody else
19 is talking, and then I can transmit.

20 Q. So is the difference between the CSMA/CD and
21 something like a T1 line the fact that our timing isn't
22 set and consistent from transmission to transmission?

23 A. So the T1 is set in timing and so on based on the
24 time slots that we're allocating, and we're using multiple
25 people that could be communicating on that bandwidth at

1 the same time, the 24 different slots.

2 Whereas on a CSMA/CD it's only one, and I'm not
3 given a specific time to transmit. My only time to know
4 when I can transmit is when I listen and don't hear
5 anything else.

6 Q. In the T1 system only one person is transmitting
7 at a specific time slot; right?

8 A. Within a -- we have an 8,000-cycle clock. And I
9 am given, if you want, 125 microseconds to be able to
10 transmit. And then counsel next to me would do his 125
11 and then next to them and so on and so forth.

12 So, yes, you're given a specific time slot in
13 that multiplexing environment, but it happens so quickly
14 that it looks like it's real time.

15 Q. Earlier you also mentioned the IBM dual coax
16 system; right?

17 A. Correct.

18 Q. Does that system use CSMA/CD?

19 A. No.

20 Q. Is the reason we have dual coaxes so that each
21 device can transmit at the same time?

22 A. There is a transmit wire and a receive wire, yes.

23 Now, the twinax that I'm referring to with IBM,
24 usually you've got a host computer and you've got some
25 form of a controller that is going to control multiple

1 terminal devices. So the twinax is used to let the IBM
2 mainframe very quickly send data down to that controller,
3 which then funnels it out to the individual terminal
4 devices.

5 Q. All right. We started this conversation by
6 discussing some of the differences between LAN and WAN;
7 right?

8 A. Correct.

9 Q. And we were talking about all these Ethernet coax
10 systems as different types of LANs; right?

11 A. The Ethernet coax was a specific Ethernet LAN.

12 Q. Were any of those Bob Metcalfe, IBM, and Wang
13 systems ever used in a WAN instead of a LAN?

14 MR. HALVERSON: Objection. Form.

15 THE WITNESS: None that I've ever run across.

16 BY MR. PIROUZNIA:

17 Q. Are you familiar with equalization?

18 A. I am.

19 Q. What is equalization?

20 A. Well, the equalization when we're transmitting,
21 we want to prevent for timing collisions, if you will, or
22 intersymbol interference, ISI.

23 When we're transmitting, we try to make sure that
24 the devices respect the timing window. So, again, if I'm
25 transmitting very quickly, it's a possibility that the

1 symbols could run into each other and cause problems.

2 So we want to prevent reflections. We want to
3 create -- we want to prevent collisions. We want to
4 equalize the network so that it will transmit without
5 those impairments.

6 Q. Is equalization only used to combat intersymbol
7 interference, as you said?

8 A. Equalization could be used for other techniques,
9 but the example I was using was where we're trying to
10 prevent ISI, intersymbol interference.

11 Q. Other than ISI, what would you use equalization
12 to prevent?

13 MR. HALVERSON: Objection. Form.

14 THE WITNESS: We also look at some of the signal
15 strength when we put it onto a cable. If I have something
16 that's really booming out, it will cause interference to
17 other systems. So we try to equalize the signal strength
18 on the cable system or on the wireless system that we're
19 transmitting on to be able to prevent those types of
20 impairments.

21 BY MR. PIROUZNIA:

22 Q. Is equalization always combatting interference?

23 A. It's balancing out the network to prevent the
24 interference, not necessarily to -- it can be also used to
25 combat it, but also to prevention.

1 Q. When did you first encounter equalization?

2 A. Oh, Lord. I mean, I've been in this business for
3 50-odd years. I don't know when I actually came across
4 it, but it was in a data communications network probably
5 in the late '60s, maybe. I don't know.

6 Q. When you say "data communications network," what
7 are you referring to?

8 A. Transmitting data as opposed to transmitting
9 voice.

10 Q. Is equalization used when you're transmitting
11 voice instead of data?

12 A. It could be used on some types of networks. You
13 know, I would use equalization, for example, to control
14 like a microwave network. It could be used in those.

15 Again, I want to make sure that I balance out the
16 network so that the transmitter and receiver aren't
17 conflicting with each other. Could be used.

18 Q. Is equalization commonly used in all types of
19 communication systems?

20 MR. HALVERSON: Objection. Form.

21 THE WITNESS: It could be used in various types
22 of networks. I don't know if I could say all, yeah.

23 BY MR. PIROUZNIA:

24 Q. What types of equalization are you familiar with?

25 A. There are several different types. There's

1 adaptive equalization, something that reacts to what's
2 happening on the network. There's fixed equalization
3 standards that we can apply. There's different
4 variations.

5 Q. Is time domain equalization one type of
6 equalization?

7 A. It could be one type, yes.

8 Q. Is frequency domain equalization one type of
9 equalization?

10 A. I could use frequency equalization, yes.

11 Q. Why would a system designer want equalization in
12 their communication system?

13 A. You have a lot of things that are going to happen
14 in a network; different impairments that can happen. So
15 as we're trying to prevent or combat issues, we might use
16 an equalization, again, to balance it all.

17 Q. And I think we mentioned ISI as one of the types
18 of communication impairments that equalization can have;
19 right?

20 A. Correct.

21 Q. And you also mentioned if our amplifier is
22 causing the signal to be booming, then perhaps we would
23 use equalization to help with that; right?

24 A. It could use an amplification equalization
25 capability, yes.

1 Q. Are there any other communication impairments
2 that come to mind that we would typically use equalization
3 for?

4 A. I don't know that I would isolate them strictly
5 for specific impairments based on equalization.

6 I know there are a number of other impairments
7 that can occur. You can have mismatches in cable systems.
8 You can have an --

9 I always joke about this, but when I had any kind
10 of a system -- a cable system out there, I'd joke about
11 Billy Bob on his bodacious backhoe going out and digging
12 up the wires.

13 When we dig up the wires, somebody has to put
14 them back together. When you put them back together,
15 there could be leaks. There could be impedance
16 mismatches. There could be a number of different issues.

17 So, yeah. I would look to what am I trying to
18 equalize for? What are the impairments I'm trying to
19 overcome? Some of it isn't necessarily going to need
20 equalization. It might need just a replacement of a
21 component, so...

22 Q. When a system designer is designing a
23 communication system, how do they determine whether an
24 equalization technique would help a particular impairment?

25 A. It may be in the design or it may be in the

1 testing and troubleshooting after we've designed and
2 installed that we realize that we've got issues, and
3 therefore, we would have to provide equalization.

4 Q. Have you seen equalization performed in LANs?

5 A. I haven't seen it on an Ethernet LAN. However,
6 it could exist on what I mentioned earlier, like a
7 WangNet. The WangNet used a dual broadband coax cable.
8 And there might be some interference between the devices
9 while they're communicating on that particular RF,
10 radiofrequency, cable system, so I could use equalization
11 to help.

12 Equalization in a lot of definitions, if you
13 will, tends to be a little bit inefficient because it's
14 impeding -- it's controlling something. So consequently,
15 you try not to have to use these things if you can do it.

16 Q. Other than the Wang coax Ethernet LAN, are you
17 familiar with any LANs that have used equalization?

18 A. As I mentioned, most of the networks that we've
19 dealt with are either Ethernet or one of those broadband
20 cable systems.

21 Q. And would you be more likely to use equalization
22 in Ethernet as opposed to the broadband systems?

23 A. No. As I've said, I've never seen it in an -- in
24 an Ethernet LAN, so it would be more of a broadband type.

25 Q. So equalization is more commonly used in

1 broadband systems than in baseband ones; is that right?

2 A. Correct.

3 Q. Have you seen equalization performed in WANs?

4 A. It would be used in a WAN, maybe in a microwave
5 radio system, maybe in a radio-to-wired system. You could
6 find that, yes.

7 Q. You previously mentioned reflections in
8 communication systems; right?

9 A. I think I did.

10 Q. What causes reflections in the communication
11 systems?

12 A. Well, it could be a device that has got an
13 impedance mismatch. They just don't match up in terms of
14 their electrical characteristics. There's a number of
15 things that could cause reflections.

16 When I transmit, I'll go into a network with some
17 form of an impedance mismatch. There might be a little
18 bit of reflected energy that goes back out or that comes
19 back in.

20 Q. Does impedance mismatch occur on all types of
21 cables?

22 A. Well, I haven't run across it on an Ethernet, as
23 I mentioned, but it can occur on -- I mean, yeah, it can
24 occur on almost any type of network out there.

25 Q. Earlier we talked about the coax Ethernet in

1 particular; right?

2 A. Correct.

3 Q. Would you not have impedance mismatch on a coax
4 Ethernet?

5 A. As I mentioned, on an Ethernet, because it's a
6 standard, the way it's been developed and everything
7 else -- everybody uses the same standards and everything
8 else -- you don't typically find a mismatch.

9 Q. Why is that?

10 A. It's -- it's a standard that's held tightly as
11 opposed to manufacturers out there making other components
12 that you'll put on different types of networks that might
13 not have the same physical or electrical characteristics;
14 where an Ethernet, everything was set as a very tightly
15 controlled standard.

16 Q. Are you familiar with coaxial cables that are
17 manufactured to a specific impedance like 75 ohms?

18 A. Yes.

19 Q. And if I had a system that was all manufactured
20 to 75-ohm impedance, would I still have a reflection when
21 that 75-ohm cable is being terminated to a 75-ohm
22 component like a splitter?

23 A. It's a possibility.

24 Who made the splitter, you know? And they may
25 not have held the same standard or the same tight

1 configuration. So my 75-ohm cable may have a difference
2 in terms of what the manufacturer made for the splitter.

3 Q. In other words, it's a matter of manufacturing
4 tolerances and not both items being perfectly at 75 ohms;
5 is that fair?

6 A. I'm assuming that both items were perfectly at
7 75 ohms, and the manufacturers agreed to the standards of
8 whatever. It would work, and I wouldn't have to worry
9 about it.

10 Q. Are you saying the tolerances were much tighter
11 with the coax Ethernet then they are with our 75 ohm coax
12 cable in our walls today, and that's why we didn't see as
13 much reflection?

14 A. That was -- that was what I was saying, is in
15 Ethernet it was a much tighter control. Excuse me.

16 When we go into a coaxial-based network, again
17 there's manufacturers that make different components, and
18 those manufacturers may or may not adhere to the tightest
19 control. You can get that.

20 Another case, as I mentioned, we might get some
21 reflections, for example, if we had a cable that was put
22 together and it was put together improperly. They didn't
23 line up properly.

24 So there's a number of other reasons that this
25 could happen.

1 Q. When you say we can have a reflection because a
2 cable doesn't line up properly, is that a form of
3 impedance mismatch or is that something else?

4 A. It would -- it would be more of a -- I don't know
5 that I'd call it an impedance mis- -- it could be, but I
6 think I would call it it's just the electrical
7 characteristics don't line up perfectly.

8 Q. We've been discussing impedance -- strike that.
9 We've been discussing reflections in coax cable
10 so far; right?

11 A. Correct.

12 Q. Can you have reflections in noncoaxial cables?

13 A. You could run into reflections in other things.
14 A wireless local area network might have a
15 situation where we get different issues, and there are a
16 number of those, yes.

17 Q. Do we encounter reflections in terminations of
18 twisted pair cables?

19 A. You could get reflections in a twisted pair
20 cable, yes.

21 Q. So our plain old telephone service twisted pair
22 cables could have a reflection where they're joined
23 together; right?

24 A. Yes. Or where they're going across a network,
25 again, where we've had that Billy Bob situation when a

1 cable repair person goes out and tries to replace them,
2 and they don't twist them right. They overlap different
3 things.

4 Q. Can we also have reflections in modern-day
5 Ethernet cables that also use twisted pair wires?

6 A. Modern-day Ethernet is run on the category of
7 wires, and there are different categories of wire that are
8 being standardly set in terms of the thickness of the
9 medium, the thickness of the wrap, and so on, how often
10 they get twisted. So there's several categories starting
11 with Category 3 up to about a Category 6E cable.

12 And depending on the speed and depending on the
13 manufacturers or whatever, yeah, you could have issues.

14 Q. Would we be more likely to have issues with
15 reflection on the lower category of Ethernet twisted pair
16 cables or the higher categories?

17 A. I -- I don't know that I could answer that
18 typically because I would have to go out and look at what
19 the actual statistics are showing us.

20 Q. The newer categories of twisted pair cable like
21 6E are higher-quality cables; right?

22 A. Much higher quality, much more tolerance in terms
23 of the twist, the number of twists that will happen within
24 a foot, how they overlap each other. So they don't lay
25 flat on top of each other.

1 There's a number of characteristics that they
2 specify, and that's so you can handle higher-speed data
3 transfer.

4 Q. Would we be less likely to have reflections in
5 these newer, higher-quality Ethernet cables than we would
6 with older plain old telephone service twisted pair
7 cables?

8 A. I think I answered that as I'd have to go out and
9 look at what all the statistics are saying.

10 I would say that the unshielded twisted pair in a
11 POTS network, because it's so vulnerable out there in the
12 ground, you're probably going to have more issues with
13 that than in a local area network where I only pull a
14 short-distance cable.

15 Q. Would a system designer look to equalization in
16 any network that is experiencing reflections?

17 A. I don't see why they wouldn't.

18 Q. Do communication systems encounter reflections
19 any time there's an impedance mismatch?

20 A. Once again, I'm -- you're asking for an answer
21 that's global, that I don't know that I could answer it
22 specifically to that number.

23 Q. Do reflections cause problems in a communication
24 system?

25 I think you referred to ISI earlier; right?

1 A. Yeah. And a reflection would cause interference
2 with something that's coming down the wire.

3 Q. Other than equalization, are there other ways a
4 system designer would mitigate the problems caused by
5 reflections?

6 A. I would imagine if they designed a network that
7 was a perfect network design or whatever, in a perfect
8 world you probably wouldn't have to worry about it.

9 Q. Setting aside a perfect world, are there other
10 techniques we would use to mitigate reflections other than
11 equalization?

12 A. There are other systems that would use different
13 techniques. We look at power or what we call PAPR, the
14 power amplitude over an average and so on. We try to look
15 at that in terms of if we're not booming out, we're not
16 going to have to deal with that.

17 So if you designed a network in such that you're
18 holding it down, but that would, of course, probably
19 impact your total throughput.

20 Q. You said PAPR. I --

21 A. P-A-P-R, yeah, power, amplitude -- it's an
22 average of power, amplitude -- I don't remember the exact
23 acronym.

24 Q. Is that a communications technique?

25 A. It's a communications terminology.

1 Q. PAPR involves power averaging, you said?

2 A. When we transmit, we send a sinusoidal wave --
3 s-i-n-u-s-o-i-d-a-l -- a wave -- an RF wave. It will hit
4 a peak. And, of course, when you hit a peak, what you try
5 to do is you don't try to keep it at that perfect peak.
6 You try to average it so it's a little bit lower.

7 So they refer to the PAPR as how we average what
8 the power would be on a transmission reading.

9 Q. So is PAPR a measurement you take?

10 A. It's used as a measurement.

11 Q. Do reflections occur in both WANs and LANs?

12 A. If I'm dealing with a broadband cable, I can get
13 the reflections.

14 As I mentioned, I don't recall seeing anything on
15 an Ethernet LAN, so you have to define which LAN we're
16 looking at.

17 Q. When you say "Ethernet LAN," are you only
18 referring to the old coaxial Ethernet LAN or are you also
19 referring to modern-day Ethernet LAN?

20 A. Well, I'm thinking in terms of the old
21 coaxial-based LANs.

22 Q. And I think I already answered (sic) this, but
23 I'll ask again just to make sure.

24 You could possibly encounter reflections in a
25 modern-day Ethernet LAN over twisted pair cable; right?

1 MR. HALVERSON: Objection. Form.

2 THE WITNESS: You could possibly run into it,
3 yes.

4 BY MR. PIROUZNIA:

5 Q. We've been discussing ISI, intersymbol
6 interference, on and off today; right?

7 A. Yes.

8 Q. When did you first encounter ISI?

9 A. Well, I started running into ISI myself
10 personally working with what we call a CDMA network, code
11 division multiple access. That was the wireless network.

12 And if you refer to the cellular networks as an
13 example, we had to be careful with ISI. We -- we're
14 dealing with coding sequences that are very, very fast.
15 So while we were dealing with setting up CDMA networks, we
16 had to be aware of the ISI.

17 Q. When were you working on the CDMA networks?

18 A. I'd say probably in the early '90s.

19 Q. And CDMA networks are a form of wireless cellular
20 networks; right?

21 A. We use it in wireless networks. It could be run
22 on another types of networks. But CDMA was the technique
23 we used here in the United States to compete with the
24 world-wide standard called GSM.

25 Q. Can you use CDMA on cables instead of using it

1 wirelessly?

2 A. All CDMA is, is a coding sequence that I'm
3 putting the data out. So I could put it in wired or
4 wireless.

5 Q. Are you familiar with any wired systems that use
6 CDMA?

7 A. Off the top of my head, no.

8 Q. What about CDMA leads to intersymbol
9 interference?

10 A. We're sending the symbols out so quickly and
11 we're coding them in such a different arrangement that you
12 can get ISI because the symbols are more or less bumping
13 into each other.

14 Q. Other than CDMA, are you familiar with other
15 types of communication systems that experience ISI?

16 A. I would imagine all of my wired and wireless
17 systems could have except for the -- what I was saying was
18 in the Ethernet, but even then we had collisions. That is
19 a function of symbols bumping into symbols.

20 Q. Is it fair to say ISI impacts all types of
21 communication systems?

22 A. It's fair to say it could.

23 Q. And we mentioned how equalizers are one way to
24 mitigate ISI; right?

25 A. Correct.

1 Q. Are you familiar with any other ways to mitigate
2 ISI other than equalizers?

3 A. Well, I'm sure if you slow the transmission down
4 and so on, and if you have your network laid out properly,
5 there'd be other ways. I haven't run across any recently.

6 Q. Are certain types of modulation schemes more
7 susceptible to ISI than others?

8 A. The higher your modulation scheme would be,
9 obviously the data bits are running down a lot, lot
10 quicker.

11 We use a technique called QAM. I'm sure we'll
12 probably talk about that today. But QAM -- basically, I
13 can use a QAM, which is like 2 bits per cycle, or I can
14 use a QAM 64, which uses 6 bits per cycle.

15 Well, when I'm receiving it on the far end, based
16 on network impairments and things like that, we get a --
17 kind of like a spot matrix, and they're all over the
18 place. I mean, they're not -- they don't all land in the
19 same place.

20 So the higher the speed, obviously the more risk
21 we're going to have.

22 Q. So you mentioned QAM.

23 That's Q-A-M; right?

24 A. Correct.

25 Q. And that stands for quadri- -- quad- --

1 A. Quadrature with amplitude modulation.

2 Q. Thank you.

3 And you said there's different forms of QAM.

4 You could have your QAM -- 2-bit QAM and your
5 64-bit QAM; right?

6 A. Correct.

7 Q. And I believe you said the higher rated QAM is
8 more susceptible to ISI than the lower rated QAM; is
9 that --

10 A. More susceptible to ISI and other thi- -- other
11 impairments in a fair instance along -- and just data
12 being misread.

13 Q. Is it fair to say anytime we're transferring data
14 at a higher rate, our likelihood of ISI goes up?

15 A. I think that would be a case.

16 Q. And you said not just ISI; right?

17 Also, other communication impairments go up the
18 more data we're trying to send down the line; right?

19 A. Sure. Noise. A number of things. Electrical
20 interference, lightning strikes. Anything could cause
21 errors in our data transmission. The higher the data
22 rate, the more errors we're liable to hit.

23 Q. Can ISI ever be completely eliminated?

24 MR. HALVERSON: Objection. Form.

25 THE WITNESS: I think we minimize it the most. I

1 don't know if I could ever say we could completely
2 eliminate it.

3 BY MR. PIROUZNIA:

4 Q. Well, in designing a communication system, it's a
5 give and take between how much ISI we want to mitigate
6 versus how much we really need to mitigate for our system
7 to function; right?

8 A. The designers would look at what the potentials
9 are and try to -- again, they try to balance a system off.

10 Q. Does ISI occur in WANs and LANs?

11 A. We're back to that -- you know, it can happen on
12 a LAN. It could happen on a WAN, but it depends on the
13 LAN or the WAN that we're dealing with.

14 Q. Well, we were talking about -- is it QAM or CAM?
15 I always get them mixed up.

16 A. I call it QAM. Quadrature starts with a "qua."

17 Q. Okay. I think I called it QAM, too, but I feel
18 like I've heard other people call it CAM.

19 What is QAM?

20 MR. HALVERSON: Object to form.

21 THE WITNESS: Wow, I wish I had a whiteboard
22 here.

23 Quadrature with amplitude modulation. When we
24 transmit a signal -- an electrical signal or an RF signal,
25 it goes through a complete sinusoidal wave; starts at

1 zero, up to 90, back down to minus 180, back up to 360.

2 So you make a circle.

3 So I've got four phases within that. I've got
4 the zero phase, I've got the 90 degree, the 135 and the --
5 and...

6 So along the way when I'm transmitting my data, I
7 can adjust the phase as well as the amplitude of the
8 signal. I can transmit it at low amplitude or high
9 amplitude. When I want to send, let's say, a one, I'll
10 put a high amplitude on the signal. When I want to make
11 it a zero, I kill the amplitude. I use a low amplitude.

12 So quadrature, four phases plus amplitude
13 modulation along the way, and it's called quadrature
14 amplitude modulation.

15 BY MR. PIROUZNIA:

16 Q. QAM is a modulation scheme; right?

17 A. It is a modulation scheme.

18 Q. Do you know when QAM was invented?

19 A. I believe back in the '60s.

20 Q. Okay.

21 A. I mean, it came with our data communications
22 networks, and we started introducing QAM as the
23 lowest-rated data transmission, if you will.

24 Over the years we've gone into the higher rates.
25 So QAM might have had just a 2-bit sequence. Now we can

1 do 6 bits. We can do 8 bits. We can do, you know, a
2 multi-bit quadrature amplitude; multiple amplitudes,
3 multiple phases.

4 So it's evolved over time, but way back when it
5 was -- all I was dealing with, a 1 and a zero, you know.

6 Q. When did you personally first encounter QAM?

7 A. I was in the Army, and we were transmitting
8 information on what we called the AUTODIN network and we
9 were using QAM. We were using QAM 16. We were using
10 QPSK, quadrature phase shift keying, and then we used just
11 straight data transfer.

12 So on the AUTODIN network, which was the
13 automatic data (sic) network for the military, that was
14 back in the '70s -- early '70s.

15 Q. What type of network was the AUTODIN network?

16 A. It was a -- it was a wide area network in which
17 we could transfer data from military installation to
18 military installation. I was in Pirmasens, Germany. We
19 were transmitting back to the States.

20 So it was a wide area network. It also
21 integrated to the satellite networks and so on.

22 Q. And you said the Army's AUTODIN network dated
23 back to the '70s; right?

24 A. Right. AUTODIN.

25 Q. DIN, D-I-N?

1 A. Yeah. AUTO -- A-U-T-O -- DIN.

2 Q. So the AUTODIN network dates back to the '70s,
3 but you started working on it in the '80s; right?

4 A. No. I was in -- in around the '70s when I first
5 came across QAM.

6 Q. Okay.

7 A. Okay.

8 Q. I wrote it down wrong earlier.

9 So you started working on the AUTODIN network,
10 including QAM, back in the '70s; right?

11 A. Yeah.

12 Q. And you said AUTODIN is a wide area network;
13 right?

14 A. Wide area data network. It was a data-only
15 network.

16 Q. And you said it involves both ground cabling and
17 satellite communications; right?

18 A. Oh, yeah. And it involved microwave. It
19 involved -- yeah. The military has many, many different
20 types of systems.

21 Q. Did the AUTODIN network use all types of cables
22 or only specific cables?

23 A. A lot of times what they were using was the
24 cables that were being provided by the local suppliers.
25 In Germany the Deutsche Bundespost would have provided a

1 lot of our lease lines to get us into certain transmission
2 networks.

3 Q. So you were using whatever the local cable
4 infrastructure was for the AUTODIN network?

5 A. A lot of times, yes.

6 Still today the military -- the Army uses AT&T,
7 Sprint, Verizon -- well, no longer Sprint. Sorry.

8 Q. And you mentioned you were working on this
9 network in Germany; right?

10 A. Yes.

11 Q. And what type of infrastructure was provided by
12 the local Deutsch cable provider?

13 A. The Bundespost would provide to us broadband
14 networks, or they would just provide us like -- we didn't
15 use T1s over there. They used E1s, which was a European
16 version of the T1.

17 They provided local copper cables into it. It
18 varied. It depended on where you were. You could go to
19 some locations, and all they had was twisted pair and just
20 dial-up communications; I mean, antiquated. But we were
21 in very small towns, too.

22 Now, when you went and crossed the Atlantic and
23 you came into the States, you would maybe bump into one of
24 the wide area network providers, maybe AT&T, and they
25 would carry it across their high-speed backbones, T3s,

1 things like that.

2 Q. I know you mentioned twisted pair cabling that
3 the AUTODIN network used.

4 Did the AUTODIN network also use coaxial cabling?

5 A. It depended on what was being provided.

6 Back in the '60s and '70s a lot of -- even here
7 in the States the Telcos were using coaxial cable between
8 different central offices because they could use RF
9 modulation and they could get multiple conversation --
10 multiple conversations on a single coax. That way it
11 eliminated the amount of twisted pair they had to run
12 between central offices.

13 So it's a technique that's been around for quite
14 some time.

15 Q. When you say it's a technique that's been around
16 for some time, what technique are you --

17 A. Using the coaxial cable or whatever they were
18 going to provide to me.

19 Q. In your experience, do wide area networks
20 typically use both coaxial cabling and twisted pair
21 cabling?

22 A. It would, you know, depend on what time we're
23 talking about. Now we've gone to fiber, and the optical
24 cables were replacing the coaxial cables that existed.

25 But the -- you know, in a wide area network like

1 an AT&T network or a Verizon network or whatever they'd be
2 using fiber. They'll use microwave radio. They'll have
3 some twisted pair. Depends on where they have to go and
4 what's available that they can install.

5 Q. Is it fair to say no matter what type of cable is
6 available, they'll find a way to utilize it in the public
7 access networks?

8 A. Yes.

9 MR. HALVERSON: Objection. Form.

10 THE WITNESS: It's fair to say that unless I go
11 in and say I want you to install for me and I will pay for
12 it, whatever they have available, they will offer. And,
13 you know, you may not have a choice.

14 BY MR. PIROUZNIA:

15 Q. So a service provider is able to create its
16 network through a combination of coaxial cable, twisted
17 pair cable, fiberoptic cable, and whatever other cable --

18 A. And radio-based systems, yes.

19 Q. Is that still the case today, or in your
20 experience, has it all been replaced by fiberoptics?

21 A. Well, there's obviously more and more going to
22 the fiber-based networks.

23 However, there are still rural communities that
24 have got -- you know, we're in Heber, Arizona. If you
25 would have talked to Frontier Network here, you'd probably

1 find out that they have very little fiber, but mostly way
2 out there the only thing is old twisted pair wires.

3 Q. Do all the types of communication systems utilize
4 QAM?

5 A. QAM is just a modulation technique. So depending
6 on what I'm doing in terms of my data transmission or
7 whatever, I would be able to use QAM, depending on which
8 level of QAM.

9 Q. Do you agree that QAM is a generic technology?

10 A. Can you define "generic"?

11 Q. What does "generic technology" mean to you?

12 A. You know, I think what you're saying is it's just
13 a -- kind of like a traditional or widely available. And
14 it is widely available.

15 Q. Do you ever use the phrase "generic technology"?

16 A. I don't think so.

17 Q. Could coaxial networks use QAM?

18 A. Yes.

19 Q. Can twisted pair networks use QAM?

20 A. Yes.

21 Q. Is QAM a form of multicarrier modulation?

22 A. QAM is a modulation technique that we typically
23 use on a single carrier, but it can be used on other types
24 of carrier-type networks.

25 Q. What do you mean by "other types of carrier-type

1 networks"?

2 A. Like you said a multi-carrier mod- -- I could use
3 QAM on that.

4 Q. You can use QAM on single carrier or
5 multi-carrier; right?

6 A. Yeah. It's a modulation technique. It's how
7 many bits am I going to produce per sinusoidal wave.

8 Q. Is QAM used in both LANs and WANs?

9 A. I would say yes.

10 Q. Are you familiar with discrete multitone, known
11 as DMT?

12 A. I am familiar with it.

13 Q. What is DMT generally?

14 A. Generically?

15 So discrete multitone is designed around using
16 multicarrier modulation techniques in which we will
17 produce a number of subchannels in a wider channel.

18 In DMT, which we also co-relate to,
19 quote/unquote, OFDM, orthogonal frequency-division
20 multiplexing, but DMT and OFDM use typically a 4-kilohertz
21 subchannel; 4.315.

22 So we take this big channel, for example -- it
23 was designed around -- DMT was designed around ADSL, which
24 I know we'll talk about later. But with ADSL we can have
25 up to 1.1 megahertz, basically, of cable transmission.

1 The bottom half is going to be used for voice, so
2 4 kilohertz is separated at the very bottom for voice;
3 zero to 4.

4 Then we have our uplink, we will say -- we'll
5 separate separate subchannels with a 4.315 space in
6 between them, and I can then transmit my uplink with
7 multiple subcarriers.

8 The rest is used for downlink. Same difference.

9 Q. When did you first encounter DMT?

10 A. I encountered ADSL back in -- I would say about
11 '96, '97. And I was in the process of looking at putting
12 in networks for some of my corporate clients, and we
13 looked at ADSL for them, using DMT.

14 Q. Does ADSL always use DMT?

15 A. ADSL is somewhat synonymous with the DMT and the
16 OFDM.

17 Q. Is there a difference between DMT and OFDM?

18 A. They're used synonymously. I think they've
19 evolved to the point that they mean the same thing.

20 Q. Back in 1996 and '97 you first encountered DMT or
21 OFDM when you were looking at ADSL service providers;
22 right?

23 A. Correct.

24 Q. Other than ADSL, what types of communication
25 systems use DMT and OFDM?

1 A. There's the DSLs. There's ADSL, SDSL. There's a
2 whole bunch of DSLs.

3 I can use OFDM in other network systems. Depends
4 on the equipment that we're putting in place.

5 Q. Can you give me examples of non-DSL communication
6 systems that you've seen OFDM used in?

7 A. 4G cellular, 5G cellular. Might have even been
8 introduced right at the tail end of 3G.

9 You can use it on our cable TV-type systems. You
10 can use it on a broadband LAN. A number of systems can
11 use OFDM. It's a multiplexing and a modulation technique.

12 Q. OFDM is a multiplexing and modulation technique?

13 A. Correct. Because the OFDM side of it is we're
14 using DMT, which is modulation, and we're using
15 multiplexing because we're using -- multiple people can
16 access the service.

17 Q. When did you first see OFDM on a broadband LAN?

18 A. I think we started using it on some of our
19 wireless local area networks, the 802.11 standards, which
20 would have been what we refer to as 802.11n. That would
21 have been in the mid-'90s.

22 Q. And when did you first see OFDM used in a cable
23 TV system?

24 A. I don't remember the exact timing, but it could
25 be used in a cable TV system.

1 I did work with a number of the folks at
2 CableLabs that were producing some of the DOCSIS
3 capabilities, and that would have been late '90s, early
4 2000s.

5 Now, OFDM wasn't used in DOCSIS until later
6 because they had their own way that they wanted to do it,
7 but then ultimately it came about with DOCSIS 3.1 around
8 2013. That's D-O-C-S-I-S, all caps.

9 Q. So you mentioned that broadband LANs used OFDM as
10 early as the 1990s; right?

11 A. Could be, yeah.

12 Q. But cable TV didn't use it, at least in the
13 DOCSIS setting, until DOCSIS 3.1, which was in the 2000s;
14 right?

15 A. 2013, yeah.

16 Q. You said DOCSIS didn't want to use OFDM until
17 2013 because they had their own way of doing things;
18 right?

19 A. They had their own way of multiplexing in the
20 types of data they were using, yes.

21 Q. What -- what was that own way of multiplexing?

22 A. Well, that was proprietary.

23 MR. HALVERSON: Form.

24 THE WITNESS: Sorry.

25 That was proprietary.

1 BY MR. PIROUZNIA:

2 Q. What do you mean by that?

3 A. In other words, they didn't tell you what kind of
4 scheme they were using.

5 Q. So DOCSIS had their own confidential and
6 proprietary way of doing things, which was different than
7 OFDM; right?

8 A. It would have been different, yes.

9 Q. Do you know how it worked?

10 A. I used DOCSIS, but I wasn't involved in the nuts
11 and bolts of how they were doing their technique.

12 Q. Do you know if DOCSIS's alternative to OFDM was a
13 form of multicarrier modulation?

14 MR. HALVERSON: Objection. Form.

15 THE WITNESS: In -- in some way they were
16 probably using something like it, but, again, it was
17 proprietary. I couldn't tell you exactly what they were
18 doing.

19 BY MR. PIROUZNIA:

20 Q. Why did DOCSIS switch to OFDM in 2013?

21 A. I think it was industry pressure.

22 Q. What do you mean by that?

23 A. People that were using -- the cable TV companies
24 wanted to be in the business of providing the triple play
25 or the quadruple play, and I think they were pushing on --

1 because DOCSIS was becoming the standard for data over the
2 cable industry specifications, and the cable companies
3 were going to them and saying, we want to have better,
4 faster, cheaper, and we want to do all four of these
5 things. We want to do voice, we want to do Internet, we
6 want to do data, and we want to do TV.

7 So I believe what was happening is the CableLabs
8 industry, which is an industry group, I think they were
9 pressured by their subscribers to do something different.

10 Q. You mentioned that DOCSIS did not use OFDM in the
11 1990s, but do you know if they were aware of OFDM in the
12 1990s?

13 A. I would say they would have been aware of it.

14 Q. Why do you say that?

15 A. Well, OFDM, DMT, if you will -- there's a
16 reference that we're using in this case called Jacobsen.
17 And Krista Jacobsen was a student at Stanford, and she did
18 a number of simulations. She didn't produce a product,
19 but she did a number of simulations on a MATLAB computer
20 to say how well could we transfer data on a coaxial cable
21 network.

22 Her whole goal was to come from the customer prem
23 back to the cable's head end. Okay. All she was worried
24 about was can we get higher-speed data across that cable
25 from the customer prem? Never dealt with a LAN.

1 Now, she came up with the idea of using DMT along
2 with another person that she worked with, who was John
3 Chioffi. They were -- John Chioffi, at the time, was
4 trying to produce products for Bell Corp., the Bell
5 Telephone Company's research group, on a standard that
6 they were looking at developing called the 802.14 local
7 area networking type -- or campus area networking type
8 standard.

9 Chioffi used -- and Krista Jacobsen used the OFDM
10 technique and the DMT functionality to be able to provide
11 multicarrier modulation out to a cable head end. All
12 right. So, I mean, they were doing it on the cables.

13 The DOCSIS standards people would have understood
14 that there was some form of a competition.

15 By the way, just for the record, Bell Corp.
16 scrapped the 802.14 decision, and they came up with a
17 different technique that would run on twisted pair using
18 OFDM, and it was called DSL.

19 Now you're getting a history lesson here.

20 Q. Oh, this is helpful. Thank you.

21 So when was this occurring, the decision between
22 coax cable and 802.14 or twisted pair and DSL?

23 A. Krista was doing a lot of her simulations in,
24 like, '94, '95.

25 And then Chioffi developed a company called Amati

1 where he was then trying to sell the DMT technologies to
2 the Bell Telephone Companies.

3 Q. Were you aware of Krista Jacobsen and
4 Mr. Chioffi's work back in the '94, '95 time frame?

5 A. I think it was closer to -- a little later than
6 that; probably in the late '90s.

7 Q. So you were familiar with Jacobsen before this
8 case?

9 A. Before this case? Oh, yeah.

10 Q. And how did you run across Ms. Jacobsen's
11 research?

12 A. Well, first and foremost, OFDM and DSL
13 technologies were coming along.

14 And secondly, I also worked on another case that
15 Krista Jacobsen was -- her research papers were also
16 included.

17 Q. When was that case?

18 A. '19. 2019.

19 Q. Before the case in 2019, you were already
20 familiar with Ms. Jacobsen from your work in the industry;
21 right?

22 A. I was familiar with the OFDM and the fact that
23 Krista was the one doing a lot of the simulations. There
24 were many, many other people, based on the different
25 conventions or whatever from the IEEE. But her work in

1 terms of coming up with OFDM services.

2 Q. You said Ms. Jacobsen's research was limited to
3 OFDM outside of a local area network context; right?

4 A. Correct.

5 Q. When did you first encounter OFDM use in a local
6 area networks context?

7 A. And that's where I said I don't recall the dates,
8 but I do recall that we used OFDM and -- yeah. I just
9 don't remember the dates.

10 Q. When you say "we used OFDM," who are you
11 referring to?

12 A. I belonged to a company called TC International
13 Consulting, and I had my coworkers, and we worked with
14 customer premises networks as well as carrier-type
15 networks. So we were working within all of the
16 technologies.

17 Q. What decade were you working with OFDM with that
18 company?

19 A. Well, late '90s into the 2000s and then some.

20 MR. PIROUZNIA: You know, we've been going for
21 over an hour.

22 Do you want to take a short break here?

23 THE COURT REPORTER: Yes.

24 THE WITNESS: Yeah.

25 (A recess was taken from 10:35 a.m. until

1 10:48 a.m.)

2 BY MR. PIROUZNIA:

3 Q. All right. Welcome back, Mr. Bates.

4 A. Thank you.

5 Q. We were talking earlier about Krista Jacobsen and
6 her work with OFDM in the '90s; right?

7 A. Correct.

8 Q. And that was specifically OFDM on coaxial wide
9 area networks; right?

10 A. Cable TV networks.

11 We've been defining WAN and LAN, and I've coined
12 a term called MAN, the metropolitan area network. In a
13 MAN what we're really dealing with is in a geographic
14 city, if you will, as opposed to across the whole country,
15 which would be the WAN.

16 So she was looking at working on how we could
17 transmit more data from an end user to the cable company
18 to get to the wide area Internet.

19 Q. So you said you've coined the term "MAN," which
20 is metropolitan area network.

21 A. Metropolitan area network.

22 Q. Is a MAN a form of a WAN?

23 A. It's not as wide as the WAN because the WAN is
24 going to spread across the whole country -- it could be a
25 whole state -- where the MAN is going to be within a city.

1 If I'm on a cable TV network, usually the head
2 end is going to be within a couple of thousand feet from
3 where the company or the customer is.

4 Q. Is a MAN a hybrid of a WAN and a LAN?

5 A. It's probably a hybrid between -- well, before we
6 go -- I also coined a term called the CAN, which is the
7 campus area network.

8 Q. Wow.

9 A. All right. So by the way, I've written a lot of
10 books in terms of defining some of these terms because of
11 what we dealt with in the industry. It was an evolving
12 industry.

13 The campus area network you might find -- oh, I
14 worked at a campus back east where we had 23 buildings all
15 interconnected, and we needed to define it. We couldn't
16 call it the LAN because it was too far away, so we called
17 it the CAN.

18 And then when we spread out to other buildings
19 within the same city, we came up with the MAN, the
20 metropolitan area network.

21 And by the way, those terms now are pretty much
22 industry standard.

23 Q. Is it fair to say we have a spectrum of networks
24 from the LAN to the WAN, and in between is the CAN and the
25 MAN?

1 A. Yeah. And a FAN.

2 Q. What's a FAN?

3 A. A foreign area network.

4 Q. Foreign area --

5 A. Foreign if we go international.

6 Q. So that's bigger than the WAN; right?

7 A. Well, the WAN, again, we typically refer to the
8 WAN as -- here in the U.S. as being across the country.

9 If I go international with satellite networks or
10 lease line networks or whatever, then we link up another
11 site on the other end. We call it a FAN.

12 Q. So if I wanted to write out my networks from
13 smallest geographically to largest, we'd have LAN, CAN,
14 MAN, WAN, FAN?

15 A. Yes.

16 Q. So circling back to Ms. Jacobsen, in the '90s she
17 was researching OFDM on coax MANs, you would say; right?

18 A. Correct.

19 Q. Were you familiar with OFDM used on coax prior to
20 Ms. Jacobsen's work?

21 A. Not really. I was familiar with another -- I
22 guess an associate of John Chioffi and Krista. His name
23 was John Bingham. And he wrote a couple of papers, and
24 one of them was Multicarrier Transmission, a time -- a
25 Technology Whose Time Has Come. And I think that was back

1 in very early '90s, maybe 1990 itself. He had written the
2 paper about using multicarrier modulation techniques.

3 And ultimately what happened was that the three
4 of them teamed up and were working on trying to come up
5 with solutions, for example, for the 802.14 solution for
6 Bell Corp. and then ultimately what became ADSL.

7 Q. Was the 802.14 standard one that was going to use
8 coax?

9 A. It was designed around using some of the coax
10 capabilities.

11 The Telcos were looking for ways to compete with
12 the cable TV companies. The cable TV companies had these
13 broadband coax cables coming in to a customer's prem, and
14 you could get very high-speed Internet access on those
15 cables.

16 The Telco had dial-up or they had what was called
17 ISDN, and ISDN was limited to a very low number,
18 64 kilobits per second, maybe even up to 128 kilobits, but
19 nothing in the megabit speeds.

20 So the Telcos were looking for a way to compete.
21 That's why they went to Bell Corp. And Bell Corp. was
22 looking at the standard of possibly using either
23 unshielded twisted pair or coaxial cable, because remember
24 now, Telcos had some of that stuff in their own networks.

25 Ultimately they decided — they scrapped it

1 because they didn't want to go put cable -- or coax to
2 every single door. That would have been horrendously
3 expensive. So they settled on doing something on
4 unshielded twisted pair, which became the standard for
5 DSL.

6 Q. You mentioned Bingham and his work from the early
7 '90s on multicarrier modulation; right?

8 A. Yeah.

9 Q. Was Bingham's work with multicarrier modulation
10 related to coax?

11 A. Not really. He was just saying multicarrier
12 modulation was just a technology whose time has come, and
13 he referenced it to unshielded versus coax. He could have
14 been on those types of technologies.

15 It was also -- I believe that's where he was also
16 talking about putting it on wireless local area networks.

17 Q. So Bingham's conclusion was just that we should
18 use multicarrier modulation regardless of the medium or
19 LAN versus WAN; right?

20 A. Correct.

21 Q. Was Bingham's work widely known back in the '90s?

22 A. Widely known. I mean, I'm in the industry, so I
23 would see a lot of these papers, and, you know, I've gone
24 to the conventions. I spoke at COMDEX and things like
25 that, so I bumped into a lot of people. And then when you

1 hear about a technology, you do the research because my
2 clients might want to be using it.

3 So it was widely known within certain circles.

4 Q. And when you say "the industry," what industry
5 are you referring to?

6 A. I'm in the telecommunications industry.

7 Q. Was Bingham's research widely known in the
8 telecommunications industry in the 1990s?

9 A. And once again, within certain circles. Not
10 everybody would have...

11 Q. What circles would those be?

12 A. The consulting and the implementation and even
13 authorship.

14 Q. Did the telecommunications industry agree that
15 multicarrier modulation was a scheme that's time had come
16 in the '90s?

17 A. Well, I think what the industry actually said
18 was, hey, it might be nice, but where do we use it?
19 Right.

20 So like anything else, when somebody comes out
21 with an idea, it has to grow. It has to mature.

22 So there were people that would have signed up
23 for it right away and there were others that said, we'll
24 wait and see.

25 A classic example would have been DOCSIS. You

1 know, those people had their own way of doing stuff.

2 Q. Now, multicarrier modulation was known way before
3 the '90s; right?

4 A. '90s.

5 Q. 1990s.

6 A. 1990s.

7 Q. Multicarrier modulation dates back previously
8 from before the 1990s; right?

9 A. I'm not sure I ran into it before that. I mean,
10 it was probably known within some industries or some of
11 the communications areas, but I don't know that it was
12 widely known.

13 Q. Maybe it's more accurate to say the theory of
14 multicarrier modulation was known, but it wasn't
15 implemented until around the '90s.

16 Would you agree with that?

17 A. Yeah. That could be, yep.

18 Q. What changed in the '90s to make multicarrier
19 modulation become more feasible to be implemented in
20 communication systems?

21 A. Competition.

22 In the '90s we had the breakup of the Bell
23 system. We had all kinds of new providers coming on
24 board, what we call CLECs, competitive local exchange
25 carriers, that wanted to offer voice, wanted to offer

1 Internet services.

2 1995, President Clinton and Vice President Gore
3 opened up the Internet to the commercial world, if you
4 will. That en- -- right away started people wanting to do
5 more, faster, better, cheaper data, and they wanted it
6 now.

7 So consequently, in the '90s was an evolution
8 after the competition, after the breakup of the Bell
9 systems. We had the Communications Act of 1996 which
10 allowed the cable companies to start offering voice and
11 Internet services or whatever. That was a standard act
12 that the FCC approved.

13 And we had almost 500 new providers coming in,
14 and as they were coming in, they needed some kind of
15 infrastructure. They weren't going to put in the old
16 unshielded twisted pair because that was expensive, slow,
17 whatever. So consequently, they were looking to using
18 fiber and coaxial cables as broadband services.

19 Q. Is it fair to say the '90s saw a demand for
20 broadband services?

21 A. I would say that would be fair.

22 Q. And is it fair to say the new demand for
23 broadband services in the '90s led to people looking at
24 multicarrier modulation as a means to transfer more data?

25 A. Right. Which is why the Krista Jacobsens and the

1 John Chioffis and people like that, and the Bingham were
2 all kind of hyping that service. Let's do more. Let's
3 get more, faster, better, cheaper on these media that we
4 have out there.

5 Q. In the '90s when this new demand for broadband
6 services occurred, were people exclusively looking at coax
7 or twisted pair or were they looking at both cable
8 mediums?

9 A. Well, they were looking at twisted pair because
10 that was the infrastructure that the Bell system had to
11 everybody's door.

12 The coaxial cable, the community an- -- community
13 antenna TV -- CATV -- networks were to a lot of people's
14 doors; not to everybody's, but it was expanding.

15 And then fiber. They started replacing some of
16 the cable -- the coax cable with fiber; fiber to the curb
17 and then coax to the door or fiber to the curb and
18 unshielded twisted pair to the door, which gave the
19 providers much more capability.

20 Q. When the providers started looking to these
21 different forms of multicarrier modulation in the '90s,
22 did they do so across all cable mediums, or were they
23 limited to just coax or just twisted pair?

24 A. Well, as I mentioned, you know, we were using it
25 on unshielded twisted pair. We were using it on coaxial

1 cable. We started using it on our wireless local area
2 networks. We were using it on wireless systems. And the
3 fiber as we were starting to come in. We would modulate
4 onto the fiber, and then the fiber would just carry it as
5 a light beam instead of an electrical or an RF signal.

6 Q. In your experience, are modulation schemes like
7 OFDM cable-specific or cable-agnostic?

8 A. I think OFDM would have been agnostic.

9 Q. In other words, you can use pretty much any
10 modulation method on pretty much any cable; right?

11 A. The modulation technique, I could use it on
12 any -- different types of medium, yeah.

13 Q. There's nothing special about twisted pair, for
14 example, that tells me, as an engineer, I need to
15 implement OFDM on twisted pair, but not coax; right?

16 A. Nothing that I would say there. It would just
17 depend on what kind of data rates you could get on it.

18 Q. Do you know who created OFDM?

19 A. No.

20 Q. Is OFDM used in both LANs and WANs?

21 A. I would use OFDM in wireless LANs. I'd use
22 OF- -- I can use it on a LAN today, like a high-speed
23 Ethernet. And I could use it on the WAN.

24 Q. What was the earliest LAN you saw that used OFDM?

25 A. It would have been in the -- probably late '90s

1 when we started to use it into, like, our wireless
2 networks, and then we could map it to our cable systems.

3 Q. So in the early '90s we were using OFDM in our
4 wireless LANs in our homes like WiFi; right?

5 A. Well, that's what a wireless LAN is, is WiFi.

6 But, again, it varied in terms of -- because
7 802.11 started about 1996, so OFDM wouldn't have come
8 until probably closer to the 2000s.

9 Q. When Bingham was researching multicarrier
10 modulation in the early '90s, did that involve OFDM, or
11 was that a non-OFDM multicarrier modulation scheme?

12 A. Oh, I think -- I think it --

13 MR. HALVERSON: Objection. Form.

14 THE WITNESS: I think it led toward the OFDM. I
15 don't know that he called it OFDM, but he was talking
16 about multicarrier modulation as being a technique whose
17 time has come, meaning we have to go away from single
18 carrier modulation to multicarrier to be able to get the
19 kind of throughputs and bandwidth that we wanted.

20 BY MR. PIROUZNIA:

21 Q. Are there forms of multicarrier modulation that
22 are totally unrelated to OFDM?

23 A. There may be. I don't know.

24 Q. You're not aware of any that are totally
25 unrelated to OFDM?

1 A. No.

2 Q. How is OFDM related to QAM?

3 A. QAM is a modulation technique, as we talked about
4 earlier. It's how many bits am I going to modulate onto
5 the carrier.

6 OFDM, if I'm -- let's take it with DSL as an
7 example. As I mentioned, we're going to have
8 256 subcarriers, each at 4.13 -- or 153 megabits -- excuse
9 me -- kilobits per second -- kilohertz.

10 So I have these multi-subchannels that are there,
11 and that will be giving me my capability of,
12 quote/unquote, the OFDM. I'm doing a multicarrier
13 modulation.

14 Now, to modulate my data onto it, I would use QAM
15 or a form of QAM.

16 Q. Does OFDM always use a form of QAM?

17 A. I think it's more the standard that everybody's
18 using, is QAM.

19 Q. Would you say OFDM built upon QAM?

20 A. I think they're separate. QAM existed. OFDM was
21 then created, and then we just applied QAM on top of OFDM.

22 Q. Could we have OFDM without QAM?

23 A. I suppose we could. I could do one bit per
24 hertz, which would put us back into the 1900s.

25 Q. If we were doing one bit per hertz, like you

1 might back in the 1900s, would you consider that a form of
2 multicarrier modulation?

3 MR. HALVERSON: Objection. Form.

4 THE WITNESS: If I'm doing one bit per hertz,
5 that's just the modulation. That's not OFDM.

6 BY MR. PIROUZNIA:

7 Q. Are you familiar with bit loading?

8 A. Somewhat.

9 Q. What is bit loading?

10 A. How many bits will I be putting onto the carrier
11 that I'm going to be transmitting with.

12 Q. Is bit loading only used in multicarrier
13 modulation?

14 A. No. I could use bit loading on a regular channel
15 without OFDM; the single carrier modulation technique.

16 Q. Is bit loading just a decision of how many bits
17 are going on one particular communication channel?

18 A. In OFDM, using the ADSL as my example, I have
19 256 subcarriers. Even though I had 256 subcarriers, they
20 weren't all equal. Some of them were noisier than others.
21 Some exam-- the quality of the cable was just crap or
22 whatever the case might be. So I put the number of bits
23 that would be capable of being carried on each of the
24 subcarriers.

25 Q. And that decision to put the number of bits on

1 each of the subcarriers based on the signal-to-noise ratio
2 is referred to as bit loading; right?

3 A. Yeah.

4 Q. When did you first encounter bit loading?

5 A. Probably when I started installing OFDM-type
6 systems, ADSL-type systems.

7 Q. That would be the 1990s; right?

8 A. Yep. Late '90s.

9 Q. Are there only specific types of communication
10 systems bit loading can be used in, or can you use it in
11 any type of communication system?

12 MR. HALVERSON: Objection. Form.

13 THE WITNESS: I don't know that I've ever looked
14 at it that way. I was never asked to look at it, so I
15 don't know that I can answer that.

16 BY MR. PIROUZNIA:

17 Q. Well, you mentioned you used it in OFDM systems;
18 right?

19 A. Correct.

20 Q. Have you used bit loading in non-OFDM
21 communication systems?

22 A. If it's a number of bits I'm putting on a
23 channel, then I would still modulate -- for example, on a
24 T1 I could have a data communications capability and I
25 could do that.

1 But I don't know that I specifically, you know,
2 went looking for it to do it.

3 Q. Is bit loading used in both LANs and WANs?

4 A. I would imagine it could be used in both.

5 Q. Earlier we started to talk about your first
6 experiences with coaxial cables that used either baseband
7 or broadband; right?

8 A. Correct.

9 Q. And I remember talking about the baseband
10 Ethernet ones, but I don't recall if we've talked about
11 broadband networks that use coaxial cables yet.

12 Are you familiar with broadband networks that use
13 coaxial cables?

14 A. Sure.

15 Q. And when did you first encounter a broadband
16 network that used coaxial cables?

17 A. In the early '90s I installed a cable TV network
18 on a campus, the CAM, and I was producing, quote/unquote,
19 the three -- what they call the three -- the triple play.
20 We could do voice. We could do data. We could do video
21 over a cable -- cable TV.

22 I worked with several of the different
23 manufacturers, Generals -- General Signal, people like
24 that, and we installed our own cable system on a campus
25 because we had multiple buildings, and it expanded across

1 the community.

2 It was a gas and chemical company. So what I
3 needed to be able to do is we had video conferencing
4 services, if you will, on the cable. We weren't showing
5 TV. You know, we weren't doing TV channels. We isolated
6 the channels to be for our test equipment.

7 We used gas chromatographs and things of that
8 nature. And while we were running the gas chromatographs,
9 when the response was coming, our engineers and scientists
10 had to see the results happening as they happened.

11 So in the campus environment we set this up that
12 we had separate conference rooms set up within each of the
13 buildings, and when we were getting close, when they knew
14 that the results were going to come, they could run into
15 the conference room and view the video of the results
16 coming.

17 I also took and hooked up a local area -- I
18 hooked up an Ethernet on the broadband cable, which is not
19 something you normally do, but I had the broadband cable.
20 So I used a technique from Digital Equipment Corporation
21 called -- now I won't remember the name -- but it was a
22 ChanBond, I think it was called. But it applied on a
23 coax -- and what I did is I pulled a 6-megahertz channel
24 off of the cable and hooked it up to an Ethernet
25 modulator, and then we hooked up our Ethernet cable

1 throughout the building.

2 Moreover, I had an IBM mainframe host, and we
3 were using what we called IBM SNA SDLC. That was IBM's
4 protocols -- we were using IBM's protocols for mainframe
5 communications. So we were moving data to those
6 controllers that I had mentioned a little bit earlier,
7 host to controller and then down to terminal.

8 And we were able to hook up a T1 interface. I
9 had a T1 multiplexer, so I was able to hook up voice
10 channels so we could make long-distance calls. We had our
11 Ethernet. We had our data communications. We had our
12 mainframe communications and we had the video capability;
13 the equivalent of a triple play.

14 I bragged about it to the local cable TV company
15 because I wanted them to do it, and they wouldn't, so I
16 did it. So back in the early '90s -- back on that campus
17 in the late '80s, early '90s.

18 And that's -- from there, then I worked with a
19 lot of the cable TV companies; Cox Communications here in
20 Arizona. I worked with several of the other suppliers who
21 were now moving out and installing their cables in the
22 '90s. That would have been like CenturyLink, Cavalier
23 Communi- -- these were the new players coming in, and we
24 were -- I was working with them in terms of layout and
25 design for their networks so that we could put the triple

1 play up.

2 Q. That's interesting. It was a lot of info, so I
3 want to make sure I understand it all.

4 A. I know. It's -- I've got a lot of stuff in my
5 back (sic).

6 Q. No. It's good.

7 Okay. So you said late '80s, early '90s is when
8 you developed this coax-based system on the chemical
9 company's campus; right?

10 A. Correct.

11 Q. And that involves running coax between multiple
12 buildings on the campus?

13 A. Yes.

14 Q. And the coax itself was carrying what you
15 referred to as the triple play; right?

16 A. Correct.

17 Q. So on the coax you were able to do video
18 conferencing between buildings; right?

19 A. Correct.

20 Q. On the coax you were able to have a LAN between
21 the buildings; right?

22 A. Correct.

23 Q. And I think you mentioned on the coax you were
24 also able to share mainframe data between buildings;
25 right?

1 A. Correct.

2 Q. And finally, on the coax you were able to share
3 voice communications between buildings; right?

4 A. Correct.

5 Q. So none of these communications between buildings
6 on the campus relied on twisted pair between the
7 buildings; right?

8 A. We had separate twisted pair, but for this
9 particular application it was on the coax. It was all on
10 the coax.

11 Q. And you mentioned, I think, that your data
12 communication coming into the campus was a T1 connection;
13 right?

14 A. I had T1s, yes.

15 Q. And that provided you with voice and data coming
16 to your campus; right?

17 A. Correct.

18 Q. So we've got the --

19 The T1 uses twisted pair; right?

20 A. Well, a T1 doesn't have to use twisted pair.
21 It's designed around twisted pair, a four-wire circuit,
22 two wires for transmit and two wires for receive.

23 Q. Did this particular T1 for the chemical company's
24 campus use twisted pair to arrive at your campus?

25 A. From the outside, yes.

1 Q. We've got twisted pair coming from your service
2 provider to the chemical campus, and from there, between
3 the buildings on the campus it's coax; right?

4 A. Right. In that environment, that particular
5 application.

6 Q. Is that the earliest example of a broadband local
7 area network over coax that you've experienced in your
8 career?

9 A. I'm trying to think.

10 I had, also, a WangNet, and that was using the
11 dual coax cables, which were broadband coax cables, on a
12 campus, and it linked up our Wang computer systems. But
13 it also had the capability -- because it was broadband, I
14 could use different applications on it.

15 Q. Was the WangNet just a data LAN and not a triple
16 play LAN, as you called it?

17 A. Right. WangNet was a proprietary network from
18 Wang. They use their own proprietary interfaces and
19 protocols and everything else to do just their data
20 network between their systems.

21 Q. Do you know what modulation scheme WangNet used?

22 A. Modulation probably would have been QAM.

23 Q. What modulation scheme did you use on your
24 chemical campus network?

25 A. We would have used QAM.

1 Q. What types of devices were able to communicate on
2 your broadband coaxial network that you developed at that
3 chemical company?

4 A. I had host computers. I had terminal devices. I
5 had controllers. I had telephony interfaces. We had the
6 video systems that were plugged in to an interface, pretty
7 much.

8 Q. And you mentioned terminal devices.
9 What do you mean by a terminal device?

10 A. Well, back in those days the terminal devices
11 were a computer terminal that may not have been very
12 smart; just a dumb terminal that was connected to a
13 controller which had all the interface or the smarts. And
14 people could then type in their -- whatever they were
15 doing onto the IBM mainframe or any of the other devices.

16 Q. Would the coax go directly between the terminal
17 computer and the IBM mainframe?

18 A. No. Earlier we talked about with the IBM
19 mainframe. So I was running the backbone network on the
20 broadband cable, and then I had an interface from IBM that
21 allowed me to come off the coax and do a different coax
22 with a twinax to go out to the controller and then the
23 twinax down to the terminal device.

24 Q. And earlier you mentioned the ChanBond,
25 C-h-a-n-B-o-n-d; right?

1 A. Yeah. I'm not sure that's exactly the name of
2 it. It was a device that DEC had provided. And then
3 later on it was taken over by a company called Bay
4 Networks.

5 But I can't remember the exact name of the
6 device, but it was an interface that camped on -- plugged
7 into the coax to be able to extract channels.

8 Q. When you say a device that extracts channels from
9 the coax, what do you mean by "extracts channels"?

10 A. Well, the coax has multiple channels --
11 6-megahertz channels. You've got multitudes of them.

12 I wanted to use one of them, so I had to
13 interface and be able to, say, take 30 to 36 megahertz as
14 a channel -- a 6-megahertz channel and plug it in to my
15 host.

16 Q. So remind me.

17 What was the name of this chemical company we've
18 been discussing?

19 A. Air Products and Chemicals.

20 Q. Air Products and Chemicals. I'm just going to
21 refer to it as the chemical company because that's a
22 little bit shorter to type.

23 Is that okay? Is it okay if I just refer to it
24 as "the chemical company"?

25 A. That's fine. Or you can call it APCI. No. "The

1 chemical company" is fine.

2 Q. Okay. So at the chemical company your broadband
3 coax network had multiple carriers on the coax; right?

4 A. Multiple channels or carrier channels, yeah.

5 Q. Right.

6 So it was using frequency-division multiplexing
7 to carry all of these channels on a single coax; right?

8 A. Yeah.

9 Q. And then you had this device that might be called
10 the ChanBond that could carve out some of those channels
11 for specific purposes; right?

12 A. Um-hum. It was called LAN City, and it was a
13 ChanBond device, but it was LAN City made by DEC.

14 Q. LAN, L-A-N --

15 A. L-A-N, City, C-i-t-y.

16 Q. So the device was called LAN City?

17 A. The company that was making the devices was from
18 LAN City.

19 Q. Okay. And would each channel or carrier on your
20 coax have a different purpose?

21 A. Well, we were using the channels for different
22 purposes. We had a video channel, 6 megahertz. We had a
23 broadband IBM mainframe. That was -- I don't think that
24 was using the full 6 megahertz. I think they were only
25 using 3 megahertz of it. But that's all right. And then

1 we divided it down to the controllers at 56 kilobits.

2 Q. I imagine you had multiple terminal computers on
3 this campus; right?

4 A. Correct.

5 Q. Did each specific terminal computer use its own
6 channel to communicate on?

7 A. Well, if I set up a channel -- a LAN channel,
8 then we would communicate across that on the RF system.

9 Q. Would a single channel in your LAN channel be
10 used for transmitting and receiving?

11 A. There would be different channels. Usually we
12 have a transmit and a receive frequency.

13 Q. We talked about the chemical company's coaxial
14 LAN as one of the earlier coaxial LANs you're familiar
15 with.

16 You said it was around the '90s --

17 A. Correct.

18 Q. -- right?

19 A. Yes.

20 Q. What about coaxial WANs?

21 Is the earliest coaxial WAN you're familiar with
22 a cable TV's coaxial WAN?

23 A. Those aren't really WAN. Those are more MAN,
24 okay, because I go from the customer prem to the head
25 end -- the cable head end, so it's typically a few

1 thousand feet. So that's metropolitan area, not wide
2 area.

3 Now, I could come out of the back end of the head
4 end, if you will, with a router and go straight out into
5 the Internet. And I would use maybe a fiber coming out of
6 the Internet service provider, directly into a router off
7 of their head end.

8 But it varied in terms of how they would do it.

9 Q. So we talked about the coaxial MANs.

10 Are you familiar with any coaxial WANs?

11 A. Well, I mean, as I was mentioning, AT&T used to
12 have a lot of coax in their backbone. Now it's mostly
13 fiber, but at the time they had coaxial cables. They --

14 It was part of what they called their carrier
15 system. It was an L carrier, and the L carrier used 22 --
16 if I recall correctly, 22 different coax cables, and they
17 multiplexed them all together to carry very large amounts
18 of voice calls and data calls and whatever.

19 Q. You said L carrier.

20 Is that --

21 A. L as in the letter L.

22 Q. Is that because it's on the L band of the
23 spectrum?

24 A. No. I think it became -- because it was a
25 coaxial, they had the "L" from coaxial. But there were

1 some L band frequencies that they would have been using.

2 Just like the T carrier. Functionally the
3 T carrier was designed around a twisted pair.

4 Q. And around what time was AT&T using these coaxial
5 cables in their WAN?

6 A. Oh, gosh. They would have put them back in
7 the -- probably the '60s -- '60s and '70s.

8 Q. And that was a broadband signal being sent on the
9 WAN; right?

10 A. Yes.

11 Q. Do you know what modulation scheme they were
12 using back then?

13 A. The modulation techniques that we were using,
14 there were different ways we'd modulate. We could do
15 amplitude shift keying. We could do phase shift keying.
16 We could do quadrature plus amplitude.

17 So QAM was kind of a standard that we were using,
18 and only occasionally you'd find somebody doing something
19 different.

20 Q. Was AT&T using QAM back in the 1960s on their
21 coax WAN?

22 A. I think they could have been, yeah. Not QAM 64,
23 but, you know, QAM 16 or less.

24 Q. Are you familiar with a device called a balun?

25 A. A balloon?

1 Q. Yeah. B-a-l-u-n.

2 A. Oh, balun.

3 Q. Balun.

4 A. Balun. Okay. Yes.

5 Q. You're familiar with a balun?

6 A. It's a balanced to unbalanced circuitry. It's
7 designed to work -- we used them on the IBM cable systems.

8 Q. What is a balun?

9 A. It was an electrical interface that took a
10 balanced to an unbalanced circuit.

11 When we were using IBM's twinax cables, for
12 example, those were balanced. When we went off the
13 network to, let's say, a terminal device, it might be on
14 an unbalanced capability, so we used a balun as the
15 interface electrically between the two systems.

16 Q. One example of a balanced cable would be a
17 twisted pair cable; right?

18 A. I don't know that I'd say that was balanced.

19 Q. What is an example of a balanced form of
20 communication?

21 A. And now you're dating me to the point that I -- I
22 don't remember exactly the -- you know.

23 Q. So at the chemical company you had this IBM coax
24 system that had both balanced and unbalanced
25 communications?

1 A. We were coming off the coax and going onto, let's
2 say, an unshielded twisted pair, which would be an
3 unbalanced circuit. So it was putting the electrical
4 characteristics properly between the two systems.

5 Q. Is a balun always used to go from a twisted pair
6 to a coax connection?

7 A. We used them that way. I think there might have
8 been other baluns that could be used between different
9 coaxials, from a -- let's say a twinax to a single cable
10 system.

11 Q. And you said one side of the communication is
12 balanced and the other is unbalanced, and so when you're
13 going from a coax to a twisted pair, you put the balun in
14 between to --

15 A. In between; correct.

16 Q. -- facilitate communication; right?

17 A. Right. So they balance them out, if you will.
18 So they make them impedance correct.

19 Q. Other than the example from the chemical company
20 in the '90s, have you worked with baluns?

21 A. I was the CIO in a law firm, and we'd had
22 different computer systems that we were using baluns on.

23 Q. In the law firm did you also use baluns to
24 interface between coax and twisted pair?

25 A. We were using IBM twinax and we were interfacing

1 to either a DEC coax or a twisted pair. It would vary
2 depending on the types of devices we were hooking up.

3 Q. And when was that?

4 A. I was in a law firm from '86 to '89, I think.

5 Q. In the '80s and '90s was it common to have an
6 interface between twisted pair and coax using a balun?

7 A. Well, it was a very easily ordered system.
8 Baluns were readily available on the marketplace that you
9 could use to interface between different computing
10 systems.

11 We had a mish-mash of different computers
12 depending on what we were trying to accomplish. Your
13 mainframe would do your back office type functions,
14 billing and accounting, stuff like that. Your front
15 office would be doing your word processing and maybe
16 graphics.

17 But if you needed to communicate between the two
18 systems, then you needed some form of an interface, and
19 that's where the baluns came into play. DEC used a
20 coax -- Ethernet coax. IBM used a twinax. We had an
21 AS/400 there that used a twinax cable, so we had to be
22 able to match the two systems together.

23 Q. In both of these examples at the law firm and the
24 chemical company where you experienced baluns, these were
25 local area networks that used the baluns; right?

1 A. We were -- local in terms of we were running our
2 own systems internally, yes. They were LANs.

3 Q. In the '80s and '90s was it common to have LANs
4 that used both twisted pair and coax in a single network?

5 A. Sure. Yeah. Every manufacturer had their own
6 way of hooking stuff up, and unfortunately, standards
7 didn't exist back then -- well, at least in the '80s,
8 until we came up with a technique called the open systems
9 interconnect protocol. But back then, you know, IBM made
10 one system. DEC made another. Wang made a completely
11 different one. And never the twain shall meet. So we had
12 to put in these interfaces to make that work.

13 Q. Back in the '90s twisted pair was considerably
14 cheaper than coaxial cable; right?

15 A. Absolutely.

16 Q. Are you familiar with the use of twisted pair as
17 an economic measure to make things cheaper, and therefore,
18 you would use a balun so that you could use twisted pair
19 instead of coax?

20 A. Well, that's why we came --

21 MR. HALVERSON: Objection. Form.

22 THE WITNESS: That's why we came up with the
23 Ethernet categories of wires -- the unshielded twisted
24 pair wires that we used for our Ethernet. Ethernet was
25 very proliferated with everybody's buildings, so we used a

1 Cat 3 to start. Then we went to Cat 4, Cat 5, Cat 6, and
2 now 6E.

3 Okay. The data rates way back when LANs first
4 got created, Ethernet ran at 10 megabits per second.
5 There were other LANs that were invented by AT&T and
6 Motorola and a couple of others that operated at 1 to
7 2 megabits per second.

8 So at the time to run a coax cable for that low
9 data rate really didn't make sense. So we put a lot of
10 emphasis on the industry standards -- the standards bodies
11 to come up with an inexpensive way to hook things up.

12 BY MR. PIROUZNIA:

13 Q. In other words, you might not need a coax for
14 your particular data rate, so you could use twisted pair
15 instead in the '90s; right?

16 A. Sure.

17 Q. And there's nothing about the type of signal
18 you're transmitting that would allow it to only be
19 transmitted on coax and not twisted pair; right?

20 MR. HALVERSON: Objection. Form.

21 THE WITNESS: Well, if we were running an
22 Ethernet on coax, we were using what we called Manchester
23 coding, which was a baseband technology.

24 Ultimately when we started to go to -- we still
25 used Manchester encoding on the unshielded twisted pair,

1 but they were evolving, and we were able to get
2 10 megabits per second on an unshielded twisted pair.

3 Later on -- I mean, today we can do gigabit
4 speeds.

5 BY MR. PIROUZNIA:

6 Q. Could you have a broadband communication that
7 went from twisted pair to coax and maintained your
8 communication line even though you were using those two
9 different mediums?

10 A. Could I? I suppose I could. I mean, I'd have to
11 have the right interface to get on that coaxial cable in
12 the channels that we want to use.

13 But mostly the Ethernet unshielded twisted pair
14 were designed around still a single transmission. We
15 weren't picking out all of the channels. We weren't
16 looking at -- I'm trying to remember how many total
17 channels we had on a cable, but, you know, it's a bunch.

18 Q. I think earlier we talked about time division
19 multiplexing, TDM, but I wanted to circle back to that.
20 Okay?

21 A. Okay.

22 Q. You're familiar with TDM; right?

23 A. I am.

24 Q. What about time duplex --

25 A. Time division duplexing.

1 Q. Time division duplexing, that's --

2 A. TDD.

3 Q. -- TDD; right?

4 A. Two completely separate types of systems. One is
5 a multiplexing technique and one is a duplexing technique.

6 Q. Would you consider TDD to be a form of TDM?

7 A. No.

8 Q. What is time division duplexing, TDD?

9 A. In a time division duplexing system we have two
10 people, one on one end, one on the other, and we talk. I
11 talk first. You talk second.

12 I can set it up in such a way that I can talk for
13 two seconds, and you can only talk for one second. But on
14 duplexing I'm using the capability of the two-way
15 transmission, but it's a batting back and forth. It's
16 like a Ping-Pong effect.

17 So time division duplexing says I can use a
18 variable amount of time between the two ends and I'm going
19 to use the Ping-Pong effect.

20 Time division multiplexing, if you recall, I said
21 I could take 24 channels on one pipe, break it down into
22 the time slots, and transmit. There would be an equal
23 return channel. So in T1, for example, there was a T1 out
24 and T1 in, 1.5 in each direction.

25 Time division duplexing, I only had one pipe.

1 Q. Earlier we talked about the CSMA/CD --

2 A. Correct.

3 Q. -- modulation scheme.

4 Is the CSMA/CD modulation scheme a form of TDD?

5 A. I wouldn't say it is, and here's the reason. I
6 said with TDD I have only one pipe, yes, but I've got one
7 person on one end and one person on the other end. We
8 just bang back and forth who gets a chance to talk.

9 On the CSMA/CD there's multiple people out there,
10 so I'm not always talking to the same person.

11 Q. In your view, TDD is always just between two
12 people?

13 A. The intent is between two people -- let me
14 rephrase that -- two end devices. It's not always people.

15 Q. When you did first encounter TDD?

16 A. When did I first encounter TDD? I suppose back
17 in around '84, '85 when we were putting in our original
18 cellular networks, wireless networks here, cellular
19 carriers, and we were using a technique called AMPS and
20 digital amps, D-AMPS. We were using those techniques to
21 be able to have people communicate.

22 In order to make it -- use the bandwidth more
23 efficiently, we used TDD, time division duplexing; about
24 '84, '85.

25 Q. And what type of network was using TDD back in

1 '84, '85?

2 A. That was a cellular network.

3 Q. Is TDD still used today?

4 A. I'm sure it is.

5 Q. Is TDD used in LANs and WANs?

6 A. It could be used depending on the LAN, depending
7 on the WAN.

8 Q. Does TDD require time synchronization?

9 A. Does it require?

10 Q. Time synchronization.

11 A. We would use some form of timing because if I
12 said I'm going to give you two seconds and I only get one
13 second, we have to know what time it is when it's my turn
14 to talk versus when it's yours.

15 Q. What types of timing synchronization are you
16 familiar with being used related to TDD?

17 A. Well, the one I'm most familiar with, of course,
18 is using some form of a beacon message, and a beacon
19 message is I send out a message to you and say let's
20 synchronize what timing.

21 I mentioned another alternative was in a T1 I
22 said those were synchronized communications. You had
23 24 slots, so you got to transmit only in your turn.

24 Now, that was TDM. That was different because it
25 was multiplexing. But we were synchronizing that

1 capability to a common clock, an 8-kilohertz clock.

2 That's what the Telco networks use.

3 TDD, though, what I would do is with a beacon to
4 notify you what time it is.

5 Q. You said you're most familiar with using a beacon
6 signal with TDD; right?

7 A. Correct.

8 Q. When did you first encounter a beacon signal
9 being used with TDD?

10 A. I don't recall the dates. You know, I do know
11 that I've used all of the different systems that we've
12 been talking about over my past 50 years, but I don't
13 remember the exact dates.

14 Q. What is a beacon signal?

15 MR. HALVERSON: Objection. Form.

16 BY MR. PIROUZNIA:

17 Q. What is a beacon signal?

18 A. It's a message --

19 MR. HALVERSON: Objection. Form.

20 THE WITNESS: It's a message that one of the
21 devices -- a transmitting device will send down a message
22 to all of the other devices to synchronize them to a
23 specific time.

24 You can also include a little bit of information
25 about the services or the capabilities of the network.

1 But it's a beacon message that gets sent down. That's the
2 beacon.

3 If you think of a beacon, one way that we used to
4 refer to it is kind of like a lighthouse. And a
5 lighthouse alerts all of the devices around based on that
6 beacon, how to find and synchronize to that light. Okay.
7 So...

8 BY MR. PIROUZNIA:

9 Q. Are beacon signals only used in TDD?

10 A. I'm most familiar with them on TDD-type networks.

11 Q. You mentioned the cellular network where you
12 first encountered TDD in the '80s, I believe; right?

13 A. Um-hum.

14 Q. Did that cellular network use a beacon for its
15 TDD?

16 A. I'm sure it did because it -- you know, you don't
17 just have two people on a cell call. You've got, you
18 know, dozens upon dozens upon dozens of people that are
19 all using the network. So they would have to know the
20 timing, the synchronization so they wouldn't over-talk
21 each other and so on. So it wasn't just one-to-one, it
22 was one-to-one in many cases.

23 Q. Is it fair to say the use of beacon signals was
24 common in TDD communication systems in the 1990s?

25 MR. HALVERSON: Objection. Form.

1 THE WITNESS: I think it probably would have
2 been, yes.

3 BY MR. PIROUZNIA:

4 Q. Are you familiar with a Fourier transformation?

5 A. Yes.

6 Q. And Fourier is F-o-u-r-i-e-r, which was the name
7 Fourier; right?

8 A. Yes.

9 Q. What is a Fourier transformation?

10 A. Well, you have TT. It's a mechanism in which --
11 that we use the Fourier transform to be able to -- we use
12 it in our OFDM capabilities to be able to take a single
13 input, for example, and then split it out. We take a
14 serial input and we make it a parallel interface, spread
15 it out across the multiple channels -- subchannels that
16 we're going to use, and modulate the data onto those
17 subchannels and then send it out.

18 Okay. There are two pieces. There's the inverse
19 Fourier transform and then there's the Fourier transform.
20 When I'm actually sending it out, I'm using the IFFT --
21 sorry -- IFTT. When I'm receiving it, I'm using the FTT.

22 So it uses a computer program capability. It
23 uses a chipset, basically, to do all of the mathematical
24 computation to be able to spread the data out across the
25 multiple channels.

1 Q. Are you familiar with the time domain and
2 frequency domain?

3 A. Yes.

4 Q. Is the Fourier transform a way to go from the
5 time domain to the frequency domain and vice versa?

6 A. And vice versa.

7 When I speak, I'm in a frequency. When I'm going
8 to send it out, I want to sent it digitally, so I'm going
9 to put it in time. And then when I receive it, I'm going
10 to take it out of digital, back to something you can
11 understand in your ear.

12 Q. When did you first encounter the Fourier
13 transformation?

14 A. It would have been -- it would have been back in
15 the '80s, again, while I was working with all our
16 different systems.

17 You know, these mathematical possibilities and
18 computations were used by a lot of the computer
19 manufacturers in order to figure out how they were going
20 to transport data, spread it.

21 Q. Was the use of the Fourier transformation common
22 in the 1980s in communication systems?

23 A. As I mentioned, the computer manufacturers were
24 using them quite a bit, so commonality would have been
25 there in the industry.

1 Individual end users, no.

2 Q. Are you familiar with the fast Fourier
3 transformation, FFT?

4 A. I'm familiar -- I've heard the term on the fast
5 FFT -- or FTT, which is why we call it the fast Fourier
6 transform. And it's a way of, I believe -- what I recall
7 is it sets up the model for the transform to take place
8 quicker.

9 Q. Is the fast Fourier transformation a faster and
10 more computationally efficient way of doing a Fourier
11 transformation?

12 A. It's using that model to make it quicker.

13 Q. Did you first encounter the FFT in the '80s, as
14 well?

15 A. I don't know when I encountered it the first
16 time.

17 Q. Do you know how the FFT works?

18 A. I'm familiar with the block diagram and how it
19 works, yes.

20 Q. Do you know if the FFT is easily implemented?

21 MR. HALVERSON: Objection. Form.

22 THE WITNESS: This is a chipset that typically is
23 going to be implemented using these mathematical models.

24 To go back to a discussion we had earlier with
25 Krista Jacobsen, she used what we call a MATLAB computer.

1 It has a mathematical simulation capability, and she used
2 that.

3 In a lot of the school systems or whatever they
4 teach their students how to use MATLAB and how to do FFT
5 capabilities or whatever.

6 Is it available to the basic user -- the end
7 user? Not hardly. They'd go crazy blind trying to figure
8 it out.

9 BY MR. PIROUZNIA:

10 Q. You mentioned computers were able to do the FFT
11 back in the '80; right?

12 A. It's computer chips that we're using.

13 So if you gave me my cell phone and said, okay,
14 we want to put an FFT in there, I'd have to know how to
15 put the chipset in there. And that's not something I
16 would do, because if you've ever looked inside a cell
17 phone, that's quite a complicated-type system.

18 Same way with any other type of terminal device
19 that I might use, for example, sitting at somebody's desk.

20 Q. So in your experience, the FFT requires a
21 specific chipset; is that right?

22 A. Usually it's a chipset that's going to be running
23 those computational models, yeah.

24 Q. And is that the same back in the 1980s as it is
25 today?

1 A. Well, today the chipsets are obviously much
2 smaller, faster, do more computational-type systems. They
3 might even onboard something else on that same chip.

4 But it's still not -- I mean, today, I mean, you
5 go to a common user -- an everyday user on a network and
6 say, put in FFT, it isn't going to happen. You're going
7 to need somebody who's special and take them out and do
8 this for you.

9 Q. Now, Ms. Jacobsen was performing FFTs in MATLAB
10 in the 1990s; right?

11 A. Correct. Those were her simulations.

12 Q. Are you familiar with MATLAB?

13 A. I am. I don't use it, but I am familiar with it.

14 Q. Is MATLAB software or hardware?

15 A. Well, MATLAB is software. I mean, that's really
16 what it's designed, but it runs on hardware, so...

17 Q. Do you need a special-purpose computer to run
18 MATLAB to perform FFTs?

19 A. I don't know if you need a special-purpose. I
20 think -- because if I put the chipsets in them, you know,
21 it becomes a -- it could become a general-purpose
22 computer.

23 Q. Let's take my computer on the desk, for example.

24 Does it have the chipsets necessary to perform
25 FFT?

1 A. You would have to go on -- you'd probably have to
2 log onto the computer that's running the simulations and
3 everything else. It could interface to it, but I don't
4 think the chipset is in there.

5 Q. In your experience, the chipsets required for FFT
6 might be on the server somewhere, but they're not in my
7 laptop; right?

8 A. Unless you say, I have to have it in there, and
9 then I could put it in there.

10 Q. In the 1980s did terminal devices have the
11 chipsets to perform an FFT?

12 A. In the '80s? I don't know. I don't think so.

13 Q. Today --

14 A. It wouldn't have happened until the late '90s and
15 then on.

16 Q. In the late '90s you would expect terminal
17 devices to begin to have the chipsets for FFT?

18 A. Yeah. We were evolving terminal capabilities.
19 Even what you have sitting in front of you, look at what
20 that does.

21 Q. You mentioned that FFT is required to perform
22 OFDM; right?

23 A. We use the FFT to be able to produce the OFDM
24 technique, yes. The OFDM output.

25 Q. Can I do OFDM without FFT?

1 A. Then I wouldn't be spreading it if I didn't have
2 the FFT, so I don't think I could.

3 Q. And you mentioned your cellular networks like
4 CDMA that did OFDM in the '90s; right?

5 A. Correct.

6 Q. Did the CDMA networks in the '90s do FFT?

7 A. Did the handsets or the networks? You know, the
8 base station is what is doing most of the work, and that's
9 a high-end computer system, so they may very well have
10 been using FFT back then. Sure.

11 Q. So in your experience, the base stations that
12 were transmitting the cellular signals to the handsets
13 were doing FFT in the CDMA networks of the '90s; right?

14 A. And the -- if that was the case, the handset
15 would have to be able to recognize it to be able to decode
16 it. Because, remember, you have to do it and then undo
17 it.

18 Q. Does that mean the handsets of the '90s had the
19 chipsets to also do FFT?

20 A. I don't recall, to be honest with you.

21 Q. Other than OFDM, are you familiar with any other
22 modulation schemes that require FFT?

23 A. Off the top of my head, no.

24 Q. Are you familiar with multiple frequency shift
25 keying, MFSK?

1 A. I've heard of it, um-hum.

2 Q. Do you know if MFSK requires FFTs?

3 A. I don't know off the top of my head.

4 Q. Now, we were talking about OFDM, but there's also
5 just plain FDM; right?

6 A. Correct.

7 Q. Does FDM require the use of FFT?

8 A. No.

9 Q. All right. I want to look at your CV, which is
10 actually attached as Appendix A to the back of your
11 declaration, starting on page 88. If you wouldn't mind
12 flipping to that in Exhibit 2007 and let me know when
13 you're there, please.

14 A. I'm there.

15 Q. Is this an accurate representation of your CV?

16 A. I would say so, yes.

17 Q. On the bottom it says, Printed October 28, 2024,
18 here in Arizona; right?

19 A. That's just a macro that's on that Word
20 processing system.

21 Q. That doesn't mean that was the last time you
22 updated this CV?

23 A. No.

24 Q. Do you know when the last time you updated this
25 CV was?

1 A. Wouldn't have been too much earlier than this,
2 because when Counsel asked me for it, I went back and made
3 sure I had everything in it.

4 Q. On the first page, do you see under Expertise
5 where you mention CATV networks, protocols, and equipment?

6 A. I do.

7 Q. And you have expertise in that area; right?

8 A. Sure. I built my own CATV network, as I told
9 you.

10 Q. That was the chemical company network; right?

11 A. Correct. And it was written up in the Harvard
12 Business Review. I'm pretty proud of that.

13 Q. That's pretty cool.

14 Now, you say networks, protocols, and equipment;
15 right?

16 A. Correct.

17 Q. What do you mean by "networks" in CATV networks?

18 A. A cable TV network is designed around a trunk
19 that comes out of the head end and then branches off and
20 then keeps branching off until it gets to the end user
21 where we drop a tap in. So it's how do we lay out the
22 cable systems.

23 As I mentioned, I worked with some of the newer
24 players that were coming into the business after the
25 telecom acts in the '90s who were trying to set up their

1 own cable networks, their own voice networks, their own
2 data networks, and so on.

3 So I'm familiar with how to lay out the cable
4 systems.

5 Q. So when you say "CATV networks," is that the same
6 as the network topology?

7 A. Sure.

8 Q. And when you say "CATV protocols," what are you
9 referring to as a protocol?

10 A. Protocols are the rules that you use.

11 We've been talking about a lot of different
12 protocols here. IBM, I mentioned we were using a twinax.
13 We used SNA SDLC. Those are the rules of how the systems
14 work; what -- how do you format, how do you send, how do
15 you receive, things of that nature.

16 Q. Are the modulation methods examples of the
17 protocols?

18 A. A modulation is a protocol that's used.

19 Q. And lastly, the equipment.

20 What do you mean by "equipment"?

21 A. Physical pieces; radios, head-end systems, the
22 branches. As we muse out, we come to different places
23 where we tap or we branch out.

24 Q. Are splitters an example of CATV equipment?

25 A. Well, a splitter would be an RF device that we

1 use at the end of the cable when we drop it into a
2 person's house, as an example.

3 We can also use splitters along the roof in the
4 topology, sure.

5 Q. Did your CATV expertise include work with
6 splitters?

7 A. Normally they would put splitters in.

8 Q. Do you use splitters in all of your CATV networks
9 that you've implemented?

10 A. Well, I would use splitters if I went into a
11 user -- for example, I was a user on a cable network, and
12 I had my splitter installed so that I could split the
13 signal coming in and pump it to multiple devices. I had a
14 cable modem. I had a TV. I had a couple of other things.

15 So what the splitter did is it took the signal in
16 and replicated the signal to multiple output ports.

17 Q. For example, the coax LAN you built for the
18 chemical company, did that LAN use splitters?

19 A. There would have been splitters on some of those
20 LAN City boxes.

21 Q. What do you mean by City boxes?

22 A. I'm sorry?

23 Q. What do you mean by City boxes?

24 A. I said the LAN City boxes. That was the company
25 that made the interfaces on my coax cable.

1 Q. Oh, I see.

2 Did the coax LAN you implemented at the chemical
3 company use equalization?

4 A. There were some folks -- some places where we had
5 to use equalization because of interference along the
6 network, yes.

7 Q. How did you implement the equalization in your
8 coax LAN at the chemical company?

9 MR. HALVERSON: Objection. Form.

10 THE WITNESS: There was an equalizer box that we
11 would use from the manufacturers. General Signal,
12 Gerald's, a couple of those manufacturers made the
13 equalizers.

14 BY MR. PIROUZNIA:

15 Q. When you say "equalizer box," is that synonymous
16 with an equalizer?

17 A. Yeah.

18 Q. Were the equalizers you used at the chemical
19 company just off-the-shelf parts?

20 A. The ones we were using there, yes.

21 Q. Did the coax LAN implemented at the chemical
22 company use TDD?

23 MR. HALVERSON: Objection. Form.

24 THE WITNESS: It may have. I don't recall
25 specifically now. It's been a while.

1 BY MR. PIROUZNIA:

2 Q. Did the LAN you implemented at the chemical
3 company use bit loading?

4 MR. HALVERSON: Objection. Form.

5 THE WITNESS: We weren't running a bit loading
6 concept at the time.

7 BY MR. PIROUZNIA:

8 Q. Did any of the terminal devices -- well, scratch
9 that.

10 If we go to page 2 of your CV, you list your
11 education experience; right?

12 A. Yes.

13 Q. Now, you'd agree with me that you don't have a
14 bachelor's degree in electrical engineering or a related
15 field; right?

16 A. Absolutely. I had an extensive set of training
17 from the United States Army teaching me a lot of the
18 electrical engineering components that we were using to
19 set up our voice and data networks.

20 I've done a number of hands-on type systems over
21 the years. As a matter of fact, a lot of my books were
22 used by universities and colleges around the world that
23 were using them for e-mail students.

24 Q. Are you familiar with the course load required to
25 receive a bachelor's degree in electrical engineering?

1 A. I think so, yeah.

2 Q. How are you familiar with that?

3 A. Well, I hired an awful lot of consultants who
4 were EEs, and I even had Ph.D. EEs working for me. So I'm
5 familiar with they had a pretty heavy course load.

6 Q. And you mentioned that some of the books you've
7 written are used in undergraduate electrical engineering
8 courses; right?

9 A. Correct.

10 Q. I have a couple of your books here.

11 We've got Broadband Telecommunications Handbook
12 and Voice and Data Communications Handbook; right?

13 A. Okay.

14 Q. Are those two examples of textbooks that are used
15 in e-mail undergraduate courses?

16 A. Yes. As a matter of fact, the Voice and Data
17 Communications Handbook was used at Berkeley, Stanford,
18 Rochester Institute of Technology, SMU. There were a
19 number of them, yeah.

20 Q. I went to --

21 A. There were --

22 Q. I went to SMU law school, so --

23 A. I'm sorry?

24 Q. I went to SMU law school, so --

25 A. Okay.

1 Q. -- right in my backyard.

2 A. So there were 166 colleges and universities that
3 bought those books from McGraw Hill Education.

4 Q. Do you know what course is taught using the Voice
5 and Data Communication Handbook?

6 A. No. What specific course? No. And I'm
7 venturing a guess it would have been multiple different
8 ones.

9 But Benedictine University used that book as a
10 graduate-level course in their finance course, just so you
11 know.

12 So it varied by school and by prof.

13 Q. Would you expect your textbooks to be used in
14 first-year electrical engineering undergrad courses or
15 more advanced electrical engineering courses or either?

16 A. I didn't know, didn't care. As long as they
17 bought the books, I was happy.

18 Q. Fair enough.

19 Are you familiar with the course load required
20 for other similar majors like computer engineering or
21 computer science degrees?

22 A. Yes. Because, you know, I was a CIO in a law
23 firm. I was the chief information officer running the
24 computer department. I automated the law firm. I took
25 away their yellow tablets and gave them computers.

1 Q. I still have mine.

2 A. So when I was hiring my MIS staff, obviously I
3 knew I had to talk to people who had computer sciences
4 degrees or programming degrees or whatever.

5 Q. For the record, what does MIS stand for?

6 A. Management information services. Now we call it
7 IT, integrated technologies.

8 Q. You were hiring e-mail and CS majors for your
9 ITs?

10 A. Sure.

11 Q. In your experience, when do electrical
12 engineering students learn about broadband networks?

13 A. I don't know that they have a course called
14 "broadband networks." They have courses that define in
15 the OSI model, layer one, layer two, stuff like that.

16 And once again that's going to depend on the
17 courseware that the individual profs or the prof head are
18 defining.

19 Q. Would you expect an undergraduate electrical
20 engineer to learn about broadband networks?

21 A. I would expect them to learn part of it.

22 Now, if I may, I've been teaching an awful lot of
23 classes on how-to in telecommunications networks; voice,
24 data, cable TV networks, T1 networks, all of those types
25 of services, which are listed in my CV here.

1 I had a lot of EE students that would come in to
2 some of my classes where we did hands-on classes. And my
3 EE graduates came up and said, I got more in this one
4 five-day class, hands on, 40 hours, than I got in college.
5 So I felt pretty good that I was doing what I was supposed
6 to be doing.

7 But that's -- I can't say that's every school. I
8 can't say it's every class.

9 Q. When students that had an EE undergrad degree
10 told you they learned more from your course, what
11 specifically were they referring to that they learned that
12 they didn't get from their undergraduate education?

13 A. The technology. The use of the technology. And
14 in a lot of cases with my hands-on classes we were doing
15 troubleshooting; break it, fix it.

16 Q. Would you expect undergraduate electrical
17 engineering students to learn about modulation schemes?

18 A. That would be another one of probably the OSI
19 modulation of layer one, layer two type schemes, sure.

20 Q. Would you expect undergraduate electrical
21 engineering students to learn about different cable types
22 like twisted pair and coax?

23 A. I would hope.

24 Q. Would you expect undergraduate electrical
25 engineering students to learn about signal splitters and

1 combiners?

2 A. I would think they would learn about some of
3 those, yes.

4 Q. Would you expect undergraduate electrical
5 engineering students to learn about port-to-port
6 isolation?

7 Would you expect undergraduate electrical
8 engineering students to learn about port-to-port
9 isolation?

10 A. I don't know that they -- they might. They might
11 not.

12 Q. Why do you say that?

13 A. Well, again, it -- I -- it all depends on the
14 prof and the direction they're taking their students.

15 Q. When you hired electrical engineering graduates
16 who had their undergraduate degree in electrical
17 engineering, did they typically know about port-to-port
18 isolation?

19 A. I don't know that I ever challenged them about
20 that.

21 I hired -- by the way, I hired a lot of EEs that
22 came out of West Point after they did their military
23 service. I was an officer in the Army, too.

24 So I hired a lot of EEs and I let -- used them to
25 go out and build or implement networks; voice networks,

1 data networks, whatever the case might be.

2 I don't know that I ever challenged them, Do you
3 understand this and this? If they had a question, they
4 would either come to me or they would come to one of my
5 other people and ask the question and get the answers.

6 Q. If an engineer graduates with a bachelor's in
7 electrical engineering and goes to work designing
8 communication systems, would you expect them to encounter
9 port-to-port isolation?

10 A. They might. It depends on what type of network
11 they're operating on.

12 Q. What type of network would you expect them to
13 encounter port-to-port isolation on?

14 A. Well, in this case the port-to-port isolation is
15 what we're dealing with, connecting a splitter up, and
16 we're hooking up different terminal devices, and we want
17 to isolate between the ports so that we don't -- when I
18 broadcast and I'm saying it to you, I don't want it to go
19 to somebody else. So I want to isolate the port-to-port
20 capabilities in that RF splitter.

21 If they're not designing, let's say, an
22 RF system, they may never get there.

23 Q. Do your books cover port-to-port isolation?

24 A. Oh, gosh, I don't know. I've written 20 books,
25 and some of -- if you read the preface, it really says,

1 hey, this is designed around you being able to figure out
2 what is it, how do I use it, what's it going to cost me,
3 what's it going to do for me. So...

4 Q. So let's start with the Voice and Data
5 Communications Handbook.

6 At a high level, what does this book cover?

7 A. That has roughly 40 chapters in it, and each
8 portion -- I took each chapter to be kind of like a
9 stand-alone component for somebody -- a novice coming into
10 the industry who wanted to learn about telecommunications.
11 They didn't want to necessarily learn every single thing.
12 Maybe they only wanted to know about voice. Maybe they
13 only wanted to know about the Telco. So I had a section
14 on how voice works. I had a section on the Telcos.

15 There's sections on ATM, the asynchronous
16 transfer mode -- all caps ATM -- frame relay, Internet,
17 TCP/IP; all the different protocols we might use.

18 So you can pick that book up and you can go to
19 one specific chapter and get about 25 to 30 pages of
20 knowledge of the system on how it works and what's it
21 going to do.

22 Are you an expert at it? No. But you certainly
23 know how to talk about it and what to look for.

24 Q. Who's the target audience for the Voice and Data
25 Communications Handbook?

1 A. Well, kind of like I just mentioned, somebody
2 coming into the telecommunications industry. It's been
3 used by more people than I ever envisioned when I first
4 put it together. I didn't target it at a EE. I targeted
5 it at an end user on how to be able to use the systems.

6 And yet, like I said, I've had EEs. I've had
7 profs from all across the country call me and ask me for
8 my slideshows, my PowerPoint presentations on all these
9 topics, and I provided them. I've actually even provided
10 the quizzes for them.

11 Q. When you say you didn't target a EE when you were
12 creating the handbook, does that mean that you approached
13 things from a more simple perspective so that end users
14 could understand it?

15 A. That was primarily what I wanted; somebody who
16 could pick up the book and understand what it is.

17 Q. Would you expect an engineer with an undergrad in
18 EE to already be familiar with a lot of what you're
19 teaching in your book?

20 A. They might be familiar with quite a bit of it.
21 They might not be. I don't know.

22 I hired -- as I mentioned, I hired EEs. I
23 hired -- I actually had a couple of Ph.D.s actually
24 teaching my books, my classes.

25 Q. The Ph.D.s that were teaching --

1 A. EEs.

2 Q. You mentioned your book was being used as a
3 textbook in graduate-level courses; right?

4 A. In some cases.

5 Q. I think you said that was a finance course; is
6 that right?

7 A. It was at Benedictine University, yeah.

8 Q. So it wasn't a graduate-level electrical
9 engineering course; right?

10 A. No.

11 Q. Okay.

12 A. But the prof that chose that book was a Ph.D. EE.

13 Q. All right. Now I understand what you're saying.

14 A. Okay.

15 Q. What about the other book, the Broadband
16 Telecommunications Handbook I have here?

17 Does that have a different target audience, or is
18 it the same as the Voice and Data?

19 A. I put maybe a little bit more detail into it.
20 You know, it was an evolution. I introduced the
21 introductory. Then I introduced specific topics.

22 If you looked at the list of books, there are
23 books on cellular networks, books on Voice Over IP, and
24 books on securing networks, books on Nortel Networks,
25 switching systems. So it varied depending on what target

1 audience I was after.

2 MR. PIROUZNIA: Let's take a break now.

3 (A recess was taken from 12:15 p.m. until
4 12:49 p.m.)

5 BY MR. PIROUZNIA:

6 Q. All right. Welcome back, Mr. Bates.

7 A. Thank you.

8 Q. I'd like to talk about the legal standard section
9 of your declaration, which is Exhibit 2007. It starts on
10 page 11, so please let me know when you're there.

11 A. Okay. I'm there.

12 Q. Section 2 contains your understanding of the
13 relevant legal standards; right?

14 A. As I have been informed by counsel, yes.

15 Q. Okay. If you'd turn to paragraph 34, you state
16 that one should look to the sources available that show
17 what a POSITA would have understood a claim term to mean.

18 Right?

19 A. Correct.

20 Q. And you say that includes the extrinsic evidence
21 concerning relevant scientific principles; right?

22 A. Okay.

23 Q. What do you mean by "relevant scientific
24 principles"?

25 A. That if we're looking at extrinsic evidence, the

1 scientific principles would be dealing with the principles
2 of the technology that's being used.

3 Q. Can you give me some examples of the relevant
4 scientific principles for the 249 patent?

5 MR. HALVERSON: Objection. Form.

6 THE WITNESS: Well, as I've already described, a
7 good much of what we've been talking about, the scientific
8 principles in terms of how FDM works, how OFDM works,
9 those -- the technology and the principles that go behind
10 them.

11 BY MR. PIROUZNIA:

12 Q. Are different modulation schemes examples of the
13 relevant scientific principle?

14 A. The modulation schemes I think would be more of a
15 single, you know, entity with multiple phases of it. But,
16 yeah, that would be a scientific principle.

17 Q. Are the relevant scientific principles the
18 science behind the modulation schemes, like the balanced
19 and unbalanced communications and the wave forms and
20 frequencies --

21 A. Right. And I --

22 Q. -- and that kind of thing?

23 A. As I've mentioned, the scientific principle of a
24 sinusoidal wave. You know, if we're going to deal with
25 the modulation techniques, we would notice the

1 scientific -- we had to deal with that sinusoidal wave and
2 what phase, what amplitude, things of that nature.

3 Q. Can you give me some examples of the extrinsic
4 evidence sources you've referred to that concern these
5 relevant scientific principles?

6 MR. HALVERSON: Objection. Form.

7 THE WITNESS: We have an Exhibit 2012 which talks
8 about some of the coaxial-type principles -- or products.

9 BY MR. PIROUZNIA:

10 Q. What is Exhibit 2012?

11 A. It's labeled as Coaxial Products, Exhibit 2012.

12 Q. Is this something you found or that counsel
13 found?

14 A. I think we may have been -- some of them may have
15 been provided by counsel. Some of them were provided by
16 me.

17 I know that counsel had asked me to look at a
18 number of the different technologies involved.

19 Q. Are all of the exhibits to your declaration
20 extrinsic evidence concerning the relevant scientific
21 principles for the 249 patent?

22 A. All of the...

23 Q. All of the exhibits to your declaration, would
24 you consider each of those exhibits to be an example of
25 extrinsic evidence that concerns the relevant scientific

1 principles for the 249 patent?

2 A. I don't know how I'd categorize that, because one
3 of the exhibits here is the Voice and Data Communications
4 Handbook. Although I talk about a lot of the scientific
5 principles, it's a book.

6 So, I mean, would I consider that to be the
7 scientific evidence? I think it's reference evidence that
8 I used.

9 Q. Well, let's take a step back.

10 A. Okay.

11 Q. You agree in paragraph 34 that a POSITA would
12 look to the relevant extrinsic evidence to determine what
13 the claim terms in the 249 patent mean; right?

14 MR. HALVERSON: Objection. Form.

15 THE WITNESS: Okay.

16 BY MR. PIROUZNIA:

17 Q. Do you agree with that; that's what you're saying
18 in paragraph 34?

19 A. That's what it's saying, yes.

20 Q. And do you agree that all of the exhibits to your
21 declaration meet that criteria of being relevant extrinsic
22 evidence?

23 A. Again, I believe that they would be incorporated
24 into it. Not all of them are scientific.

25 As I mentioned, the book -- the Voice and Data

1 Handbook is an exhibit, but it's not a scientific
2 principle. It's a book that discusses the different
3 technologies.

4 Q. It's a book concerning relevant scientific
5 principles; right?

6 A. Yeah. I would agree with that.

7 Q. So, therefore, it's extrinsic evidence concerning
8 relevant scientific principles; right?

9 A. Okay. I'll agree with that.

10 Q. Is your answer the same for all of the exhibits
11 to your declaration, or do you consider any of those to be
12 irrelevant to the 249 patent?

13 A. I don't believe I have anything that was
14 irrelevant.

15 Q. Other than the exhibits to your declaration, can
16 you give me any other examples of extrinsic evidence you
17 would look at to understand the terms of the 249 patent?

18 A. Well, it would depend on the terms. I mean, the
19 patent has several terms involved in it, such as OFDM.
20 And as I mentioned, I looked at what OFDM is. I was
21 familiar with OFDM and how it was used to create ADSL, for
22 example.

23 So those would be the examples I would look at.

24 Q. If a POSITA was trying to understand the term
25 "OFDM" at the time of the 249 patent, what examples of

1 extrinsic evidence would the POSITA look to to understand
2 that term?

3 A. Well, the patent itself. The specification
4 oftentimes gives you definitions in terms of whether or
5 not the patentee is a -- they're a lexicographer,
6 l-e-x-i-c-o-g-r-a-p-h-e-r, yeah. That would be part.

7 I would look at the specification. If there were
8 any external references already used in the patent, I
9 would look to those.

10 Oftentimes what happens in the patent or in the
11 specifications, the examiner might reference certain
12 things. So a POSITA might look there.

13 And then just in general in the technology
14 itself -- in the industry itself there would be references
15 that would be available, not the least of which is they
16 might use the Internet to go out and do some searches.

17 Q. At the time of the 249 patent, what are some
18 examples of extrinsic evidence that were known in the
19 industry concerning the technology field of the
20 249 patent?

21 A. Well, what would have been known would have been
22 modulation techniques. As we've talked about, they've
23 come a long way.

24 Q. Um-hum.

25 A. OFDM. At the time of the patent the DSL books

1 were published, so that would be extrinsic evidence that
2 we could look to.

3 The technologies in terms of cabling systems,
4 wiring, twisted pair versus coaxial cable, that would be
5 information that would be available.

6 Q. Were there specific textbooks that the industry
7 was using at the time of the 249 patent to generally
8 understand communication systems?

9 A. There were. There were a number of them. I
10 would hope that mine would have been some of them. But
11 there are several others.

12 I'm familiar with a lot of the authors on
13 telecommunications books and so on: William Stallings,
14 Tanenbaum, Gibson. There were a number of authors that
15 had specific books that talked to these technologies.

16 Q. You said Stallings, Tanenbaum, and what was the
17 third one?

18 A. Gibson.

19 Q. So Stallings, Tanenbaum, and Gibson wrote
20 textbooks that were commonly used in the industry at the
21 time of the 249 patent?

22 A. Sure.

23 Q. Were those communications textbooks?

24 A. Communications or electronic engineering type
25 booklets, yep.

1 Q. Were those textbooks that were used in electrical
2 engineering undergrad courses?

3 A. Might have been. I think Tanenbaum was common,
4 and Gibson might have also been.

5 Q. Do you know if those three authors' textbooks
6 taught OFDM at the time of the 249 patent?

7 A. I don't know. I don't have the books in front of
8 me.

9 Q. Would you have expected those textbooks to refer
10 to OFDM at the time of the 249?

11 A. They might have. It depends. I mean, they had
12 several different books and several different versions,
13 so...

14 Q. Outside of textbooks, were there specific
15 publications or articles that the industry tended to keep
16 up with at the time of the 249 patent?

17 A. Well, I'm a member of the IEEE, the Institute for
18 Electronic and Electrical Engineers.

19 There are always papers that are being published
20 by individual members either for conferences or for the --
21 it's an association. The association's papers that they
22 publish by their own users. So there's a number of those.

23 Q. If we go back to your declaration, in
24 paragraph 38 you refer to determining the ordinary and
25 customary meaning of a claim term requires examination of

1 terms that have a particular meaning in a field of art.

2 Do you see that?

3 A. Correct.

4 Q. What is the field of art for the 249 patent?

5 A. The -- I have a section that I've actually
6 defined here in which we were talking about broadband
7 coaxial LANs on a broadband coaxial network, and then the
8 endeavor of the art is just that, broadband coaxial LANs.

9 Q. In your mind, is there a difference between the
10 field of art and the field of the invention, or are those
11 two terms synonymous?

12 A. Well, the field --

13 MR. HALVERSON: Objection. Form.

14 THE WITNESS: The field of the invention talks
15 exactly to that specific thing, and that would still be
16 part of the art. I mean, it's -- we're looking at the
17 field of art as the broadband coaxial networks running a
18 local area network.

19 BY MR. PIROUZNIA:

20 Q. So in your opinion, is the 249 field of invention
21 also broadband coaxial LANs?

22 A. That's the title of the patent, so I would
23 consider it that, yes.

24 Q. So because it's the title of the patent, you
25 would consider it the field of the invention as well?

1 A. Well, the field of the invention is also
2 described as one of the sections in the patent, in the
3 249, saying, what is the field of the invention?

4 Q. Well, we can look at the patent if you want. I
5 think it's in volume 1 of your exhibits.

6 A. That's what I was looking for.

7 Q. DISH-1001 is the exhibit number for the
8 249 patent.

9 If you look at the first page, could you tell me
10 if you have something in particular you're referring to as
11 the field of the invention?

12 A. Well, once again, the title, in itself, is
13 telling me what this is all about. It's a Network
14 Interface Device and a Broadband Local Area Network Using
15 Coaxial Cable.

16 Q. And so in your opinion, that is the field of the
17 invention; right?

18 A. That is one of them, sure.

19 And then there's a section in here in which it
20 says on column 1, the Technical Field, the invention
21 relates to broadband communications networks and
22 specifically to network interface devices and network
23 wiring.

24 So it's pointing to the specific field that we're
25 talking about.

1 Q. Is broadband communication networks the field of
2 invention, or is it network interface devices and network
3 wiring?

4 A. It's a combination. It's a network interface and
5 a broadband local area network using coaxial cable.

6 When I look at the patent, I look at the title,
7 and then I also take a look at what the technical field is
8 about.

9 Q. In your opinion, are there multiple fields of the
10 invention or just one?

11 MR. HALVERSON: Objection. Form. Asked and
12 answered.

13 THE WITNESS: It's the one that I just referred
14 to. The title and the technical field is -- it relates to
15 a broadband communications network and specifically to the
16 network interface devices and the wiring. It's a coaxial
17 cable network.

18 BY MR. PIROUZNIA:

19 Q. I think the reason there's some confusion between
20 you and I is that the title says "coaxial," but the
21 technical field in column 1 doesn't say "coaxial."

22 So I'm trying to understand which of the two you
23 consider the field of invention, or is it both of them
24 smashed together?

25 MR. HALVERSON: Objection. Form.

1 THE WITNESS: I see the field as being a
2 broadband communications network, and the network wiring
3 is the coax, which is defined in the title. I think the
4 two of them have to relate to each other.

5 BY MR. PIROUZNIA:

6 Q. So the field of invention is the title and the
7 technical field mashed together?

8 A. I'd say that it's -- the field of the invention
9 is not twisted pair. It's not wireless. It's the
10 broadband coaxial cable networks.

11 Q. If you flip in your declaration to paragraph 51,
12 which is still in the legal standard section, you talk
13 about how prior art can teach a way from combining known
14 elements; right?

15 A. Okay.

16 Q. And if you flip to the next page, as the
17 paragraph continues, in the last sentence you state that,
18 Similar subject matter may not be sufficient motivation to
19 combine references.

20 Do you see that?

21 A. Correct.

22 Q. What do you mean by "similar subject matter"?

23 A. Well, if I'm dealing with a technology, in this
24 particular case, as an example, the discussion rolled
25 around is ADSL analogous to our broadband coaxial cable

1 networks?

2 And in my declaration I said they're not. They
3 are -- although they're communications technologies,
4 they're dealing with different wiring systems and they're
5 dealing with the technology to multiplex communications.
6 They are different. They're not analogous.

7 Q. Let me make sure I understood that.

8 In your opinion, ADSL is a similar subject matter
9 to the 249 patent, but it's not analogous to the
10 249 patent; is that right?

11 A. In the similarities I said it's a communications
12 technology. Sure. It's -- it's in the field of
13 telecommunications, but they're not -- I wouldn't see them
14 as being the same and I would see them as being different.

15 Q. If you flip ahead in your declaration to the next
16 section, which is No. 3, Level of Ordinary Skill in the
17 Art, do you see that?

18 A. I do.

19 Q. And Section 3 contains your opinions regarding
20 the relevant level of ordinary skill in the art; right?

21 A. Correct.

22 Q. In paragraph 58 you state your disagreement with
23 Dr. Acton's identification of the level of skill in the
24 art; right?

25 A. Correct.

1 Q. And you opine that a POSITA would need two to
2 three years of experience relating to the design and
3 development of broadband networks over coaxial cables;
4 right?

5 A. Yeah.

6 Q. And you also agree that additional graduate
7 education may substitute for professional experience?

8 A. Correct.

9 Q. What type of graduate education would be
10 sufficient for your definition?

11 A. In looking at what a POSITA said, it starts out
12 that, in my opinion, a POSITA would have a bachelor's
13 degree in electrical engineering or a related field or
14 equivalent understanding. Okay.

15 So if it was more than a bachelor's degree, it
16 would be a master's or a Ph.D. or whatever. So sufficient
17 would be that you had additional education as opposed to
18 the real-world experience.

19 Q. The question is, how much additional education do
20 you think is necessary?

21 MR. HALVERSON: Objection. Form.

22 THE WITNESS: I believe that normally we look in
23 these areas of patents, or whatever, is typically a
24 bachelor's degree and a couple of years experience. You
25 get the bachelor's degree, and then you got to come out

1 and you got to work on it.

2 Now, in my case, as we talked earlier, I don't
3 have a BS in EE, but I've got tons of experience --
4 hands-on experience doing it. So I've got much, much more
5 than the two or three years of experience, but I don't
6 have the schooling, if you will, other than what the
7 military gave me in terms of training me on RF design, on
8 networking, on standards, and so on, as well as what I've
9 done myself in -- hands-on in the industry.

10 BY MR. PIROUZNIA:

11 Q. So that gets to whether professional experience
12 can take the place of educational experience.

13 I'm asking a slightly different question about a
14 hypothetical POSITA without professional experience, but
15 that has both undergraduate and graduate electrical
16 engineering educational experience.

17 Does that make sense?

18 A. Yep.

19 Q. So for a hypothetical POSITA to meet your
20 definition, what type of graduate electrical engineering
21 coursework would be required?

22 A. Since we're talking hypotheticals, what I would
23 say is if they didn't -- if they had the BS without the
24 real-world experience, but they continued on and got the
25 master's, that would be what we normally would say.

1 Q. Would they need to finish their master's in
2 electrical engineering or would a certain amount of
3 coursework in graduate electrical engineering suffice for
4 your definition?

5 A. That's a hypothetical that I would have to think
6 about an awful lot to answer that particular question. I
7 have never opined on that.

8 Q. Are there specific graduate-level electrical
9 engineering courses that you think are necessary to be a
10 POSITA for the 249 patent?

11 A. I would think if we're going to be looking at it,
12 we would want somebody who has experience in broadband
13 cable networks and education in that.

14 My disagreement with Dr. Acton -- Acton --
15 forgive me -- was that he was saying it's signal
16 processing. The patent talks specifically to broadband
17 coaxial networks. So that would be the type of experience
18 that I would see somebody having.

19 Q. Would you expect a graduate student in electrical
20 engineering to learn about broadband coaxial networks?

21 A. I would hope there would be something in terms of
22 a broadband coaxial network.

23 As I mentioned earlier, it may not have that
24 title, but in terms of the electrical engineering and the
25 training that I've seen is you get experience in the OSI,

1 the open systems interconnect model, in which it defines
2 physical layer, media access control layers, networking
3 layers. Those would be the three layers I would expect
4 somebody to have some of that experience.

5 Q. Would an engineer that has experience in the OSI
6 layers you just mentioned qualify as a POSITA?

7 A. If the engineer had the electrical engineering
8 degree plus the experience or the understanding of these
9 OSI models, it may well qualify for the extra or the
10 additional exper- -- training.

11 Q. Do you have an opinion of whether or not
12 Dr. Acton qualifies as a POSITA?

13 A. I would never challenge him. I believe he is a
14 POSITA, yes.

15 Q. If we go to the next section of your declaration
16 Section 4 on page 23, that's where you introduce the
17 249 patent; right?

18 A. Yes.

19 Q. And if you flip ahead to paragraph 69, you
20 discuss where the 249 patent provides descriptions of
21 considerations to limit ISI; right?

22 A. You said paragraph 69?

23 Q. Yes.

24 A. Thank you.

25 Yes.

1 Q. You say, As of the time of filing, these systems
2 and teachings described in the 249 patent had not been
3 implemented on the LAN communicating over coaxial cable.

4 Right?

5 A. I see that.

6 Q. And you cite to the 249 patent at column 3,
7 lines 4 through 7.

8 Do you see that?

9 A. Yes.

10 Q. If you flip to that part of the 249 patent, and
11 you'll see that's the background section of the
12 249 patent; right?

13 A. Okay. It's part of the background.

14 Q. Do you see the prior art references referred to
15 by the 249 patent in its background section?

16 A. It does refer to some of the other broadband
17 networks such as Gibbs, Humpleman.

18 Q. You're looking at column 2, starting at line 42
19 through 56?

20 A. Correct.

21 Q. Those are prior references referred to by the
22 249 patent; right?

23 A. Those are a ref- -- yes.

24 Q. Did you review each of those prior references
25 listed in the 249 patent?

1 A. In great detail, no. I think I skimmed through
2 most of them.

3 Q. Do you consider the prior references in the
4 background section of the 249 patent to be analogous art
5 to the 249 patent?

6 A. Well, Gibbs refers to broadband networks using a
7 bidirectional communications network.

8 Let's see. Humpleman refers to a home multimedia
9 network architecture.

10 So they're referring to analogous art.

11 Q. Would you expect the 249 patent to refer to prior
12 art references that were not analogous art?

13 MR. HALVERSON: Objection. Form.

14 THE WITNESS: I don't know that they would or
15 wouldn't. I don't know what the patentee had thought
16 about.

17 BY MR. PIROUZNIA:

18 Q. Can you identify any of the prior art references
19 in column 2 that you do not consider to be analogous art?

20 A. Nothing that I was asked to opine on, so I never
21 even thought of it, no.

22 Q. Can you identify any of the prior references in
23 column 2 of the 249 patent that you consider to be in a
24 different field of endeavor than the 249 patent?

25 A. I couldn't do that right now, no.

1 Q. Do you consider the prior art references in
2 column 2 of the 249 patent to be pertinent to the
3 particular problem the 249 patent was trying to solve?

4 A. I believe what the patentee was showing was in
5 the background invention -- of the invention was these are
6 some of the inventions that had been awarded to people,
7 but had not solved the total problem that the 249 has set
8 out to solve.

9 Q. In your opinion, why did the 249 patent pick
10 these prior art references to address in column 2?

11 MR. HALVERSON: Objection. Form.

12 THE WITNESS: I have no opinion on why they
13 picked it. I have no idea.

14 BY MR. PIROUZNIA:

15 Q. Well, you mentioned that they didn't solve the
16 problem that the 249 patent seeks to solve; right?

17 A. Well, the 249 is doing something a little bit
18 different, but it's using broadband coaxial networks to
19 solve the issue.

20 Q. Do you know if the references in column 2 of the
21 249 patent were also using broadband coaxial networks?

22 A. They're describing high-speed data
23 communications, bidirectional broadband networks,
24 multimedia. I think they kind of work around it.

25 Q. If you didn't review each of the references in

1 column 2 of the 249 patent in detail, how can you say for
2 certain that they did not solve the problem the 249 patent
3 is trying to solve?

4 A. If they solved the problem that the 249 was set
5 out to solve, then you wouldn't have the 249, would you?

6 Q. So in other words, you're relying on the fact
7 that the 249 patent issued to come to the conclusion that
8 these prior art references in column 2 did not solve the
9 problem; is that right?

10 A. What I'm relying on is the fact that the patentee
11 said to the patent office, here's an issue, here's the
12 background of the issue, and here are other people who
13 have been assigned patents to solve specific issues. We
14 do something different.

15 Q. Is it fair to say you didn't fact-check what the
16 applicant for the 249 patent said to the patent office in
17 column 2 of the 249 patent?

18 A. I glanced through the prosecution history, but I
19 did not fact-check to say they swore that they told all
20 the truth and nothing but the truth, no.

21 Q. Do you know if any of the prior art references in
22 column 2 teach of a LAN communicating over coax?

23 A. Off the top of my head, I don't recall.

24 Q. Do you know if any of the prior art references in
25 column 2 of the 249 patent teach of equalization?

1 MR. HALVERSON: Objection. Form.

2 THE WITNESS: Again, same -- same answer.

3 If I back up on one, you said do the prior art
4 talk about LAN communications. And one of them is titled
5 LAN Ethernet tran- -- Ethernet -- which is LAN --
6 transport facility over digital subscriber lines issued to
7 Rubinstein.

8 BY MR. PIROUZNIA:

9 Q. Why did you focus on that reference in
10 particular?

11 A. Because you asked about does it talk about LANs,
12 and that one talks Ethernet, which is LANs.

13 Q. Do you know if any of the prior art references in
14 column 2 teach of multicarrier modulation?

15 A. There was a discussion of -- well, that one with
16 Rubinstein talked about over DSL, and we've been talking
17 about DSL as that's where DSL was implemented using
18 multicarrier modulation.

19 Q. Would you expect a POSITA, at the time of the
20 249 patent, to be familiar with multicarrier modulation?

21 A. A POSITA probably would because we've said that
22 OFDM existed before that.

23 Q. We were talking about the prior art references in
24 column 2.

25 Did you also review the prior art references on

1 the face of the patent and in the file history of the
2 patent?

3 A. No.

4 Q. Are you familiar with the Kliger prior art
5 reference?

6 A. Is that one of the one -- one of the ones you're
7 referring to on the front of the page?

8 Q. Yeah. Kliger is on the face of the patent. It's
9 the third-to-last prior art reference on the right column,
10 if you can see that.

11 A. Okay.

12 Q. Does Kliger ring a bell to you?

13 A. I don't recall.

14 Q. If we go back to your declaration, paragraph 70,
15 71, and 72 list the independent claims of the 249 patent;
16 right?

17 A. 71 is claim 5 and 72 is claim 10; two of the
18 independent claims.

19 Q. Well, paragraph 70 is claim 1; right?

20 A. Oh, 70, yes. Okay.

21 Q. In your opinion, does claim 1 require
22 multicarrier modulation?

23 MR. HALVERSON: Objection. Form.

24 THE WITNESS: In my opinion, it is referring to a
25 multicarrier modulation.

1 BY MR. PIROUZNIA:

2 Q. And why do you say that?

3 A. It refers to all of the pieces that we're talking
4 about within the patent, but it also describes providing
5 frequency bins with more transmit bits which occupy parts
6 of the channel where the signal is -- where the
7 signal-to-noise ratio is high.

8 And as we've been discussing with OFDM, what
9 we're doing is we're breaking this down and creating,
10 quote/unquote, the frequency bins.

11 Q. Is the frequency bin limitation you just referred
12 to the same thing as bit loading?

13 A. I would say they're analogous.

14 Q. And in paragraph 71 you refer to the fact that
15 claim 5 has similar limitations as claim 1, but adds an
16 OFDM requirement; right?

17 A. Correct. Because it states OFDM.

18 Q. So you'd agree claim 5 also requires multicarrier
19 modulation; right?

20 A. OFDM is a multi-channel modulation technique,
21 yes.

22 Q. In your opinion, does claim 10 require
23 multicarrier modulation?

24 MR. HALVERSON: Objection. Form.

25 THE WITNESS: It does not say it's requiring

1 OFDM, and yet each of the components that's being
2 described in it are basically describing the same thing as
3 what the coaxial cable network is all about.

4 BY MR. PIROUZNIA:

5 Q. In your opinion, does claim 10 require
6 multicarrier modulation or not?

7 MR. HALVERSON: Same objection.

8 THE WITNESS: It's still a broadband local area
9 network of claim 5, which does require the OFDM -- oops, I
10 might have jumped my line. Sorry.

11 It's a broadband local area network for
12 transmitting modulated signals using the coaxial cable
13 building wiring containing a plurality of branches and so
14 on.

15 I read that to be the same thing as if we're
16 looking for multicarrier modulation here.

17 BY MR. PIROUZNIA:

18 Q. Well, in your opinion, a single carrier
19 modulation system could not infringe on claim 10; right?

20 MR. HALVERSON: Objection. Form. Beyond the
21 scope.

22 THE WITNESS: In single carrier modulation we
23 would wind up having to use the equalization capabilities.
24 And this does say we perform equalization on the received
25 signal that restores the flat frequency response to

1 overcome the communications, and it overcomes the channel
2 impairments caused by the reflected signals.

3 So I could use a single carrier modulation with
4 equalization or --

5 BY MR. PIROUZNIA:

6 Q. Are you saying --

7 A. -- I could use multicarrier modulation.

8 Q. Are you saying -- you're saying single carrier --

9 A. Single.

10 Q. -- not -- not signal carrier?

11 A. Single. My bad.

12 Q. That's okay.

13 So in your opinion, you could have a single
14 carrier modulation system with equalization, and that
15 would satisfy the requirements of claim 10; is that right?

16 A. I would say we could do that.

17 Q. Alternatively, you could have a multicarrier
18 modulation system with equalization and satisfy the
19 requirements of claim 10?

20 A. If I had multicarrier modulation, I probably
21 wouldn't use the equalization.

22 Q. We can agree claim 10 requires equalization;
23 right?

24 A. It requires?

25 Q. Equalization; right?

1 A. It calls for equalization.

2 Q. So in order to meet the limitations of claim 10
3 we need equalization.

4 We can agree on that; right?

5 A. Correct. Because we have dependent claims right
6 below it that says equalization is going to be a frequency
7 domain equalizer.

8 Equalization -- in claim 12 it says the
9 equalization is time domain equalization.

10 Claim 13 is the equalization is adaptive, so it's
11 requiring that we're going to use equalization.

12 Q. Right.

13 And also, the last limitation of claim 10 says,
14 Wherein the terminal devices perform equalization.

15 Right?

16 A. Correct.

17 Q. So we agree claim 10 requires equalization;
18 right?

19 A. Correct.

20 Q. And where I'm still not sure where we landed is
21 whether or not claim 10 requires single carrier
22 modulation, multicarrier modulation, or it can be either
23 one.

24 A. And in claim 14, The network of claim 13 --
25 excuse me.

1 14 says, The network of claim 13 wherein the
2 terminal devices used orthogonal frequency-division
3 multiplexing (OFDM) modulation to overcome the channel
4 impairments caused by the reflected signals.

5 OFDM is multicarrier.

6 Q. Does that mean that you think claim 10 also
7 requires multicarrier modulation or just that it's
8 possible to do multicarrier modulation to meet claim 10?

9 A. In claim 10 I would say it's possible to use OFDM
10 or single carrier modulation with equalization.

11 Q. Earlier you pointed to the preamble about a
12 broadband local area network for transmitting modulated
13 signals using coaxial cable building wiring as possible
14 indication that we were using multicarrier modulation.

15 Did I understand that correctly?

16 A. Are you reading from someplace I should see?

17 THE COURT REPORTER: And please slow down.

18 BY MR. PIROUZNIA:

19 Q. Oh, so let's all look at the preamble of
20 claim 10.

21 A. Thank you.

22 Q. It's in your declaration in paragraph 72 and it
23 is also in the patent in column 10, so either one of
24 those. Just let me know when you're there.

25 A. Okay.

1 Q. Earlier I recall you referring to a broadband
2 local area network for transmitting modulated signals
3 using coaxial cable building wiring containing a plurality
4 of branches and stating that that limitation makes you
5 consider this to be a multicarrier modulation system. But
6 maybe I misunderstood what you were trying to say, so
7 could you please clarify.

8 A. And I believe what I was saying was it could be
9 either/or. It could use OFDM.

10 Q. I think we're on the same page now, but I'm just
11 going to say it one more time so -- so we're clear. Okay?

12 Okay?

13 A. Yes. I'm sorry.

14 Q. I'll ask a --

15 In your opinion, claim 10 can be satisfied by
16 either single carrier or multicarrier modulation; right?

17 A. And what I'm saying, it could be, yes.

18 Q. Okay. Thank you.

19 Let's go to the next section, which is the
20 technical background, and it's Section 5 on page 27 of
21 your declaration, Mr. Bates. Please let me know when
22 you're there.

23 A. Okay.

24 Q. All right. Do you see Figure 1 on page 28?

25 A. I do.

1 Q. Where did Figure 1 come from?

2 A. My computer. I don't -- I didn't have a
3 reference on it, but I had it in my computer from probably
4 some of the stuff I've written in the past.

5 Q. And in paragraph 76 you talk about how trunks can
6 host approximately 500 local connections, and in the past
7 it could have been 2500; right?

8 A. Correct.

9 Q. Why could trunks host more in the past than
10 currently?

11 A. It was a combination of things that were taking
12 place.

13 When they were first putting out their cable TV
14 networks in a community, the cable companies were trying
15 to cover as much as they possibly could, so they were
16 feeding up to 2500 local drops for the cable systems.

17 As, you know, the -- as they got more experience
18 in deploying cable systems, I think what they realized was
19 you could reduce the amount of terminal devices and still
20 be able to satisfy the customers with bigger, better,
21 faster.

22 So it was one of those things that just evolved
23 in terms of the network. It wasn't a technology issue as
24 opposed to a satisfying the community.

25 Q. Why were they able to reduce the amount of

1 terminal devices needed?

2 A. Well --

3 MR. HALVERSON: Objection. Form.

4 THE WITNESS: -- if I run a trunk out and I pull
5 the branches off and then put the drops off -- if I just
6 put in 500 and not 2500, I've reduced the number.

7 So they were able to still satisfy the distance,
8 the speed, the capabilities, and not have to overpopulate
9 the network.

10 BY MR. PIROUZNIA:

11 Q. I was thinking of terminal devices in a home, but
12 maybe you're referring to the --

13 A. Drops.

14 Q. Okay. So you're saying the equipment got more
15 sophisticated, so they could do the same amount of
16 communication with fewer trunks; is that right?

17 A. With fewer drops off of it.

18 Q. Okay.

19 A. So the drop is what was into the commun- -- the
20 consumer's house.

21 Q. Okay.

22 A. That's the drop.

23 Now, if we were doing strictly cable TV, you'd
24 have a cable modem or something, and it can be done.

25 But I could handle as much as 2500 drops within a

1 community when we first started, but then later that --
2 just because of numbers, satisfying the customer, or
3 whatever the case might be, they started reducing the
4 number that they were going to satisfy.

5 Q. In paragraph 78 on the next page you refer to, in
6 the mid-'90s, how cable was upgraded to what is known as
7 broadband networks.

8 Do you see that in paragraph 78?

9 A. I do.

10 Q. What are you referring to that was upgraded?

11 A. In terms of what they were providing in the
12 cable, what I basically said here is instead of just being
13 a TV drop, what they were able to do is put in the cable
14 modem, for example, that would allow me to hook up a TV,
15 allow me to hook up a PC or a printer or whatever, and
16 still be able to go out to the broadband Internet -- go
17 across the broadband cable to the Internet. I should have
18 said wide area Internet, but...

19 Q. Was the actual cable itself upgraded or just the
20 equipment in the wide area network?

21 A. Actually, over time -- when we first started
22 using the cable, we were using a much narrower bandwidth.
23 A lot of the original cable systems had, like,
24 350 megahertz of capacity. Over time they went to 600.
25 Then they went up as high as 900 megahertz and now up into

1 a gigabit -- or a gigahertz.

2 So the cables themselves, as they were -- well,
3 remember in the mid-'90s -- I was telling you earlier with
4 the Telecommunications Act of 1996, the cable companies --
5 the new cable companies were starting to lay out the
6 higher-grade quality cables.

7 Q. So when you refer to the cable being upgraded in
8 paragraph 78, you're referring to both the cable and the
9 devices and network?

10 A. Yes.

11 Q. Were the terminal devices in people's homes also
12 upgraded in the '90s?

13 A. Terminal devices may or may not have. It
14 depended.

15 I think I said in here that, you know, when they
16 first put the systems out, it was, okay, you get a
17 cable -- you get a cable TV and you get a PC and you could
18 use the Internet.

19 But then I said to the fact that most people
20 wanted bigger, better, faster. They wanted more. They
21 had printers. They had more than one terminal device, so
22 a PC. Could have been anything.

23 Q. Is a cable modem a terminal device?

24 A. I would consider a cab- -- a termination device
25 for the cable, yeah.

1 Q. Were the cable modems upgraded in the mid-'90s?

2 A. Well, Motorola, Arris, and a whole host of
3 companies were improving upon what they called the
4 SURFboards -- what Motorola called the SURFboards. Those
5 were the cable modems; faster, better, cheaper for them.

6 Q. We talked about DOCSIS as one of the standards
7 used by cable modems; right?

8 A. Correct.

9 Q. Were there alternatives to DOCSIS?

10 A. Well, DOCSIS became a standard that people would
11 use. It was a data over cable industry...

12 Anyway, what they were doing is trying to develop
13 standards for all the cable companies because, yes, a
14 different modem -- a cable modem manufacturer might have
15 used different methodologies to hook up a customer.

16 Q. And we talked about how DOCSIS didn't adopt OFDM
17 until 2013; right?

18 A. Correct.

19 Q. Did any of the alternatives to DOCSIS adopt OFDM
20 earlier than that?

21 A. I don't know that I can answer that question. I
22 wasn't asked to look at that.

23 Q. Are you familiar with any cable modems that used
24 OFDM prior to DOCSIS using it?

25 MR. HALVERSON: Objection. Form.

1 THE WITNESS: Well, when Krista Jacobsen was
2 developing her model and everything else, she had been
3 working with Chioffi. And I believe Chioffi might have
4 come up with a cable modem that could have used -- I don't
5 know specifically that he did, because he was working --
6 trying to do the 802.14.

7 BY MR. PIROUZNIA:

8 Q. So it's possible Chioffi developed a cable modem
9 that used OFDM in the '90s.

10 Is that what you're saying?

11 A. I feel -- I don't want to speculate because I
12 don't know.

13 Q. All right. In paragraph 78, as it continues on
14 page 30, you mentioned that in the late 1980s General
15 Signal introduced analog cable signals to digital signals
16 on a standard 6-megahertz channel.

17 Do you see that?

18 A. Correct. Yes.

19 Q. What do you mean by that? I'm having trouble
20 parsing that sentence.

21 A. Well, cable modem technology uses radiofrequency,
22 which is typically analog.

23 General Signal came up with a compression
24 technique and a digital conversion technique that could
25 convert the analog signal to digital and get a lot more

1 channels on a 6-megahertz TV channel.

2 Q. Was that 1980s General Signal system using QAM?

3 A. More than likely. As I -- as we've mentioned,
4 QAM was kind of like the standard modulation technique for
5 the data modulation.

6 Q. Do you know what the compression technique that
7 was used by General Signal was called?

8 MR. HALVERSON: Objection. Form.

9 THE WITNESS: I don't recall the name that they
10 called it.

11 BY MR. PIROUZNIA:

12 Q. And then -- sorry.

13 In paragraph 79 you mentioned that customers
14 wanted the connectivity to use coax cable for
15 communications over the Internet; right?

16 A. I'm sure I said that.

17 Q. I think it's the first sentence in paragraph 79.

18 A. Um-hum.

19 Q. And then you also mentioned that customers wanted
20 to communicate between various devices in their home;
21 right?

22 A. Correct.

23 Q. And I think it's about midway through the
24 paragraph you mentioned that when the user transmitted
25 data between desks, the signal was being sent upstream to

1 the cable head end and then back down to the device.

2 Do you see that?

3 A. Correct.

4 Q. Is that referring to communications between two
5 computers in the same home going through their cable
6 modem, up to the head end, and back down to a second cable
7 modem in their home, to a second computer?

8 A. A second computer. It could be a second cable
9 modem or it might be separate. But it would be going up
10 and back down.

11 The cable -- the CMTS, the head end, controlled
12 the data flow. So when I sent data out of my terminal, it
13 had to go up to the CMTS and come back down.

14 Q. Could it have been one cable modem that was
15 serving two computers in the same home, but the
16 communication still left your home to the head end and
17 came back down?

18 A. Could have been.

19 Q. And you say that this prior art communication to
20 the head end created a problem with interference; right?

21 A. Yes. And unnecessary traffic on the cable.

22 Q. Is the interference you refer to in paragraph 79
23 the same as the ISI we've been referring to before or is
24 it something different?

25 A. It could have been collisions. All of the things

1 that we talked about this morning; collisions, ISI, noise.

2 Q. How did the prior art systems you referred to in
3 paragraph 79 mitigate that interference?

4 A. In many cases they didn't mitigate it, and that's
5 where the 249 came in to solve some of these problems that
6 were taking place.

7 So the cable companies were trying to use --
8 well, yes, in order to eliminate it, they were trying to
9 use equalization. They were trying to use -- clean the
10 cable up, if you will, do away with the taps, the leaks,
11 and stuff like that.

12 Q. The prior art coax systems you refer to in 79
13 were able to communicate between two computers in the same
14 home over coax.

15 They just had to do so via the head end; right?

16 A. There was a head end that was controlling and
17 managing the whole network. So we were sending it up to
18 the -- if you will, the -- I referred to server earlier
19 on -- but up to the head end server, and then it would
20 generate it back down, yes.

21 Q. So coaxial communications over this LAN were
22 possible. They just had to go to the head end and come
23 back, and that's what you state caused this problem of
24 interference and unnecessary traffic?

25 A. Correct.

1 Q. And you mentioned one way the cable providers
2 might have mitigated that was equalization; right?

3 A. That was one way, yeah.

4 Q. It was just that, in your opinion, there was
5 still a problem that necessitated the desire to keep
6 everything within one home; is that fair?

7 A. And people wanted to be able to keep it. You
8 know, they wanted to transmit from their PC to the printer
9 without having to go all the way back up -- up and back
10 down.

11 And the cable companies themselves, they only had
12 so many uplink channels and so many downlink channels. So
13 on the uplink it was from 5 megahertz to 42 megahertz.
14 You start sending all that data up and back down, then
15 effectively you're going to cause congestion,
16 interference, and a whole host of things.

17 Q. A few more questions on this background section.
18 Then we can take a short break.

19 On the next page, page 31 of your declaration, do
20 you see Figure 2?

21 A. Yes.

22 Q. Is that another figure that came from your
23 computer?

24 A. Probably. I have a -- well, might even be in
25 that book.

1 Q. Oh, yeah.

2 On the next page, in paragraph 81 you
3 mentioned -- strike that. I've already asked this
4 question.

5 Okay. Let's flip to paragraph 89 on page 36, and
6 please let me know when you are there.

7 A. I'm there.

8 Q. You say, OFDM is a digital signal communication
9 technique initially developed for use in cable television
10 systems; right?

11 A. Correct.

12 Q. What are you referring to as that initial use of
13 OFDM in cable television systems?

14 A. Well, you know, OFDM may well have existed
15 earlier, but wasn't really proliferated.

16 When Jacobsen and Bingham and Chioffi all were
17 trying to come up with a way of communicating more data on
18 the cable, they started looking at the discrete multitone
19 capability.

20 Remember now, Bingham was the one that introduced
21 the documentation saying DMT or multicarrier modulation, a
22 technique that's time has come.

23 Chioffi and Jacobsen did the simulations, and
24 they determined that a single carrier modulation using
25 equalization was very inefficient and wouldn't work well,

1 so they decided that multicarrier modulation was a better
2 technique. That's where the OFDM kind of blasted down to
3 us.

4 Q. So in paragraph 89 when you refer to OFDM first
5 being used in cable television systems, you're referring
6 to the research of Chioffi and Jacobsen; is that fair?

7 A. And Bingham.

8 Q. In the 1990s; right?

9 A. Actually, she wrote a lot of that in '94, if I
10 recall, but she had done a couple of other papers earlier
11 than that.

12 Q. Was OFDM already being used in CDMA prior to that
13 work in the '90s on the cable television systems?

14 A. And I believe I said it was TDD, and CDMA is a
15 different technique. We're using a code division multiple
16 access. That's a CDM modulation technique.

17 Q. Maybe I'm getting mixed up.

18 So CDMA doesn't use OFDM?

19 A. Today it probably does, but --

20 Q. But back then --

21 A. -- when it first came out back in '95, no.

22 Q. DSL's use of OFDM occurred after the OFDM use you
23 mentioned in paragraph 89; right?

24 A. Well, DSL came out after Chioffi and Jacobsen had
25 done their studies. And as I said, it came out, I think,

1 in the late '90s. It took some time. Once something gets
2 developed, you know, they just don't roll it out. It
3 takes time to standardize it. Takes time to write all the
4 protocols and whatever. So that came out later.

5 Q. So if I'm making an OFDM timeline, the first
6 entry is OFDM's use in cable television systems, and then
7 afterwards we have OFDMs used in DSL; right?

8 A. I would say yeah, we were looking at OFDM in
9 cable first and then later in DSL.

10 Q. What about in WiFi and the IEEE 802.11?
11 Was that before or after OFDM's use in cable
12 television and DSL?

13 A. And I think what I had said, it wasn't until
14 802.11n that we started using OFDM, and that was -- we
15 went through a, b, g, and then n, so that would have been
16 after the 2000 window.

17 Q. Yeah. If I'm remembering correctly, we didn't
18 have 802.11n until sometime in the 2000s.

19 A. Yeah.

20 Q. The last sentence of paragraph 89, you mention
21 OFDM is based on FDM; right?

22 A. Okay.

23 Q. Do you still agree with that statement?

24 A. Well, orthogonal frequency-division multiplexing,
25 it has FDM in it, but it's different than FDM because it's

1 orthogonal. All right.

2 And the figure that I show, Figure 3 next to it,
3 the orthogonality -- this is probably a bad picture. But
4 the orthogonality happens at -- when channel 1 is at zero
5 voltage or at zero amplitude, channel 2 next to it is at
6 its peak, and channel 3 will be at zero. So they don't
7 interfere with each other.

8 Frequency-division multiplexing was a technique
9 where I could take a frequency and I give it one user to
10 one user on their own frequency.

11 This uses the multitude multicarrier, okay,
12 multitude of frequencies in an OFDM environment, so I have
13 one to many, if you will, or many to one.

14 Q. And you say OFDM uses a multitude of transmitters
15 and receivers to send information on different frequencies
16 over a single wire; right?

17 A. Correct.

18 Q. And the example you give is an electrical power
19 cable; right?

20 A. Okay.

21 Q. Are you familiar with OFDM being used on an
22 electrical power cable?

23 A. That came much later, yeah.

24 Q. Is that power -- I mean --

25 A. Pow- -- yeah. Ethernet over power lines.

1 Q. Ethernet over power lines, yeah.

2 You say "much later."

3 Do you know around when OFDM was being used on
4 electrical power cables?

5 A. Oh, that came well after. It would be 2008,
6 2009, somewhere.

7 MR. PIROUZNIA: All right. Let's take a break.

8 (A recess was taken from 1:52 p.m. until
9 2:03 p.m.)

10 BY MR. PIROUZNIA:

11 Q. All right, Mr. Bates. Let's go to Section 7 of
12 your declaration, which starts on page 36.

13 A. Okay.

14 Q. This is where you describe the prior art at issue
15 in the IPR; right?

16 A. Correct.

17 Q. Subsection A is on the Amit reference; right?

18 A. Yes. You pronounce it different than I do, but
19 that's okay.

20 Q. How do you pronounce it?

21 A. Amit.

22 Q. Amit.

23 In paragraph 94 you mention that the Amit HomeCN
24 is a simple design; right?

25 A. Simple design, yes.

1 Q. Why do you consider it to be a simple design?

2 A. Well, the way it's designed is it's extract -- or
3 it's separate from the regional cable network, so the data
4 communications is going to stay in-house. It doesn't have
5 to go up to the network and back down.

6 This also uses what we refer to as a transponder.
7 So we do a frequency change. When I transmit on one
8 frequency, the transponder receives it, changes the
9 frequency, and sends it to the second device.

10 So it's fairly simple in terms of you won't have
11 a lot of interference, you don't have a lot of bumping in,
12 you know, and so on.

13 Q. So when you say Amit's HomeCN is a simple design,
14 you're specifically talking about the single home mode and
15 the transponder mode; is that right?

16 A. Correct. The single home mode.

17 Q. Do you consider the connected home mode to be a
18 simple design, as well?

19 A. I believe it was -- that Amit said it was a
20 little more -- it was more complicated.

21 Q. Do you consider a coax LAN to be a simple design?

22 MR. HALVERSON: Objection. Form.

23 THE WITNESS: A coax LAN is, yeah, you know, a
24 very generic term, but it could be complicated. It could
25 be simple. It just depends on what you're trying to

1 configure.

2 BY MR. PIROUZNIA:

3 Q. What do you mean, it depends on what you're
4 trying to configure?

5 A. Well, if I set up a LAN that only had one PC and
6 one printer, as an example, they would still be on the
7 same network. Not a lot going on there.

8 But if I have multitudes and my cascading-type
9 connections, then it might be far more complex.

10 Q. Is the use of reflections to communicate in the
11 coax LAN a simple design?

12 A. I don't know I design it that way, but the use of
13 micro-reflections would be a function of what's gone on
14 that LAN.

15 Q. Is the use of micro-reflections to communicate
16 something you would consider a simple design?

17 A. Well, I don't think it would be very complex.

18 Now, if, in fact, we're going to do some of the
19 techniques of the 249, I did take exception to that where
20 if, in fact, everything that the 249 deals with is a home
21 design that's designed to be simple. Okay.

22 However, okay, we talked about the terminal
23 devices of being the smart devices in the 249. And as we
24 talked earlier, if we're dealing with the Fourier
25 transform and so on, an end user wouldn't necessarily be

1 able to do that. They wouldn't necessarily have that
2 experience.

3 Amit -- everything that Amit was writing to and
4 everything else was inexpensive, simple to use. The
5 consumer should be able to do it.

6 So I took those two differences in terms of how
7 they kind of work.

8 Q. Are the terminal devices in the 249 patent the
9 same as the terminal devices in Amit?

10 A. A terminal device could be a terminal device. I
11 mean, there are PCs. There's other devices.

12 The terminal devices for the 249 could be a PC,
13 could be a router. It could be an Ethernet splitter. It
14 could be a number of different things.

15 Q. And you said both the 249 patent and Amit are
16 trying to have simple terminal devices; right?

17 MR. HALVERSON: Objection. Form.

18 THE WITNESS: I think what I said is in 249 it
19 was more complex because when we're going to deal with all
20 the technologies that are needed in the 249, the user --
21 the end user wouldn't necessarily be able to accomplish
22 that.

23 BY MR. PIROUZNIA:

24 Q. Maybe you said 249 terminal devices want low-cost
25 terminal devices, as well.

1 Let me scroll back up and see exactly -- give me
2 a second.

3 Everything the 249 deals with is a home design
4 that is designed to be simple.

5 A. In Amit.

6 Q. So in Amit you think the termination devices are
7 simple, but that's not necessarily a goal of 249 patent.

8 Is that what you're saying?

9 A. What I'm saying is if we're going to make the
10 necessary changes with the OFDM technique, for example, on
11 the 249, I would not see an end user being able to do
12 this.

13 I talked about earlier the chipsets and how if
14 you have to take a system apart -- I don't think anybody
15 would take one of these systems apart, as an example. But
16 that's today.

17 Back then, the same thing. Taking the terminal
18 device -- whatever the terminal was apart and try to up --
19 you know, put the chipsets in to do the OFDM, I don't see
20 that as being something that an end user would have done.

21 Q. So in your mind, one of the differences between
22 the terminal devices of Amit and the terminal devices of
23 the 249 patent are that the 249 patent's terminal devices
24 require FFTs to do OFDM; right?

25 A. More complex. And Amit -- definitely everything

1 Amit is looking to do is to put it in simple, inexpensive,
2 and easy to use.

3 Q. Would terminal devices that are capable of
4 performing equalization at the time of the 249 patent fall
5 into the bucket of the simple terminal devices of Amit or
6 the bucket of the complicated terminal devices of the 249
7 OFDM embodiments?

8 A. At the time of the equalization back in around
9 2000, I still think that an average user on a 249 would
10 not know how to do it.

11 BY MR. PIROUZNIA:

12 Q. Why are you focusing on what an average user
13 would know how to do?

14 A. Because that's the people that are sitting there,
15 using that LAN in their home. Okay. So the coaxial cable
16 LAN is being used by an average user.

17 Q. So I understand, in your opinion, an average user
18 might not know how to implement equalization and OFDM at
19 the time of this 249 patent, but would a POSITA know how
20 to implement OFDM and equalization at the time of the 249
21 patent?

22 A. Yeah. I don't even know that a POSITA would have
23 at around 2000, you know, because at the time back in
24 2000, and, well, even today now, there were -- there are
25 specialists that come out and do these installs.

1 When you ordered up a cable system, for example,
2 they send their people out to install it, make sure it's
3 up and running. They test it. They train you, things
4 like that.

5 I'm not sure where the POSITA would fall in that,
6 just being able to know about it versus being able to do
7 it.

8 Q. You mentioned that a goal of Amit is for the end
9 user to be able to implement the technologies necessary
10 for these terminal devices; right?

11 A. Yeah.

12 Q. Where is that understanding of yours based on?

13 A. It's --

14 Q. Amit is in the first volume. It's DISH 1005 --

15 A. I have it.

16 Q. -- if you'd like to --

17 If you're not immediately finding it, we can move
18 on in the interest of time.

19 A. Okay. I know I've seen it, and it's in several
20 places. But he does refer to it. I think it was one of
21 the numbered paragraphs. But okay.

22 Q. But it's fair to say your understanding of Amit
23 is one of Amit's goals is to be able to implement the
24 network by an end user; is that fair?

25 A. Correct.

1 Q. If we go back to your declaration, at
2 paragraph 94 you mention that in single home mode the
3 HomeCN is disconnected from the regional cable network.

4 Do you see that?

5 A. You said it was 94?

6 Q. Yeah. At the bottom of page 37.

7 A. Yeah.

8 Q. Do you see that?

9 A. The HomeCN is a simple design, and the HomeCN is
10 disconnected from the regional network.

11 Q. If the HomeCN is disconnected from the regional
12 cable network, are the HomeCN devices capable of
13 communicating with devices outside of the home?

14 A. Well, if you're not connected to the network, you
15 wouldn't connect to devices outside the home; correct.

16 Q. That's a "no"; right?

17 A. That's a "no."

18 Q. Okay. So in your opinion, the single home mode
19 does not utilize a cable modem; is that right?

20 A. It's using a transponder to be able to
21 communicate between the two.

22 Now, when we -- if we have to go up to the
23 network, we could use the cable modem.

24 Q. If we were using a cable modem, would we still be
25 in single home mode in Amit?

1 A. If we look at a table in column 22, it talks
2 about the management functionality. And that's what we're
3 using the CMTS for.

4 So the home connect mode units -- identify all
5 the units that are sharing the same HCN. And that's done
6 by all; both the only-connected home -- it -- it's done by
7 all, the single and the connected mode.

8 Q. All right. Let's break that down.

9 You're looking --

10 A. Sure.

11 Q. -- at the table -- Table NNN in column 22 --

12 A. Correct.

13 Q. -- of Amit; right?

14 A. Correct.

15 Q. And this is describing different management
16 functionality that applies to either all or just the
17 connected home mode; right?

18 A. Correct. Correct.

19 Q. When this table refers to "all," is that
20 referring to connected home mode --

21 A. Both types.

22 Q. -- and single home mode?

23 A. Yeah, both types.

24 Q. Is there any other mode types of Amit other than
25 single home and connected home, in your opinion?

1 A. No. No. Those are the two.

2 And if you read down on the head end management,
3 down just two lines there, if you look over, it says,
4 enabling management from the head end, and that's only
5 connected home mode.

6 Q. So what conclusion are you able to draw from
7 Table NNN regarding the use of a cable modem in the single
8 home mode?

9 A. Well, I'm using the cable modem to talk to the
10 head end. Right.

11 So in the connected home mode I use the cable
12 modem to talk to the head end, and the head end provides
13 all the management functions for it.

14 Q. So Table NNN is telling us in the head end
15 management row that head end management only occurs in
16 connected home mode; right?

17 A. The management is being done by the -- yes.

18 Q. In other words, there's no head end management in
19 single home mode, per Table NNN; right?

20 A. Yeah. In the single home mode, like a
21 stand-alone device, so I'm not going to be communicating
22 to other devices outside the network.

23 Q. So let's go back to my question --

24 A. Okay.

25 Q. -- about cable modems in the single home mode.

1 In your opinion, can the single home mode use a
2 cable modem?

3 A. In my opinion, it could use the cable modem to go
4 up, but not to talk across.

5 Q. So in paragraph 94 when you say single home mode
6 requires the HomeCN to be disconnected from the regional
7 cable network, you're not saying that there's absolutely
8 zero communication from the home to the regional home
9 cable network?

10 A. Correct. I'm disconnected from the LAN side of
11 it on a connected home mode where I have to go up and come
12 back down. I'm only communicating within the network on a
13 single channel. Right.

14 But it's a cable modem, so I'm still going to be
15 able to get TV. But for the LAN purposes, when I
16 transmit, it will go to the transponder and be transmitted
17 back in without going all the way up to the cable
18 modem and -- to the CMTS and back.

19 Q. In a single home mode system with a cable modem,
20 how do the terminal devices know whether they're
21 communicating with one another or whether they're
22 communicating via the cable modem up to the head end?

23 A. In a single home mode we're communicating on a
24 single channel, a frequency up and a frequency down just
25 to the transponder. They're only talking to each other

1 through that transponder on Channel 900 to 906, if I
2 recall correctly.

3 Q. I think we have a little confusion here, so maybe
4 if we look at one of the figures of Amit, we can get on
5 the same page.

6 Can you flip to Figure 2 of Amit and let me know
7 when you're there.

8 A. Okay. I'm at Figure 2.

9 Q. Okay. And do you see the notch filter in
10 Figure 2 that is listed as optional?

11 A. Yes.

12 Q. So in your opinion, is Figure 2 depicting single
13 home mode, connected home mode, or potentially either one?

14 MR. HALVERSON: Objection. Form.

15 THE WITNESS: So the home connected is determined
16 by the presence of the notch filter at the point of entry,
17 so that would be home connected mode.

18 BY MR. PIROUZNIA:

19 Q. Figure 2 shows us a notch filter at the point of
20 entry; right?

21 A. Correct.

22 Q. And it's your opinion that because the notch
23 filter is there, we are in connected mode?

24 A. And that's the way Amit describes it, with the
25 presence or the absence of the notch filter.

1 Q. What is the purpose of the notch filter?

2 A. To reflect the signals back in.

3 So I may be saying it -- what the notch filter is
4 designed to do is when I transmit, the notch filter
5 doesn't let the signal pass through. It reflects it back
6 in to the network.

7 Q. And does that reflection occur in both single
8 home mode and connected home mode or just one of the two?

9 A. Let me take a look at what the patent says on
10 Figure 2.

11 So in column 6, the way it reads is Figure 2
12 shows the home cable networking, HCN, that has five nodes;
13 204-207, and 212 -- there's others there, but it doesn't
14 list them -- of the cable TV network and is connected to
15 the regional CATV plants via cable [201].

16 Notch filter [202] is a band reject filter that
17 does not pass a certain RF range that is used by the home
18 networking device. This filter improves the isolation
19 between the home network and other homes -- so it's
20 reflecting the signal -- as well as the regional network.
21 However, the use of such a filter is optional as we
22 believe that the disclosed system and method is functional
23 with the isolation levels of a CATV network without the
24 additional notch filtering.

25 So it's basically saying that the notch filter

1 for the home connected mode is an optional service.

2 Q. You were reading from column 6 in Amit; right?

3 A. Yes. I thought I said column 6.

4 Q. You may have. I'm just making sure.

5 So based on what you just read in Amit, is it
6 your opinion that Figure 2 is depicting single home mode
7 or connected home mode?

8 A. That would be connected network mode.

9 Q. How did you reach that conclusion?

10 A. I'm sorry?

11 Q. How did you reach that conclusion?

12 A. Because I just read it.

13 Q. And in your opinion, can Amit operate in
14 connected home mode with the notch filter being in place?

15 A. It says it's optional. It can be connected with
16 or without.

17 Q. So in your opinion, we can do connected home mode
18 with or without a notch filter; right?

19 MR. HALVERSON: Objection. Form.

20 THE WITNESS: In reading column 6, it says it's
21 optional.

22 BY MR. PIROUZNIA:

23 Q. Can we operate the network of Figure 2 in single
24 home mode?

25 A. So on column 7 at line 24 what it basically says

1 is the home connected -- HomeCN supports two operational
2 modes, single home operation mode. This mode is
3 required -- requires a notch filter or an amplifier that
4 usually supplies similar functionality, or it can be
5 operated in a system that is not connected to a CATV plan.

6 So once again, either/or here.

7 The connected home mode. This mode does not
8 require the notch filter -- because it did say it was
9 optional. The mode is more complex and requires
10 additional functionality. Following are some of the
11 functions that are required in the connected home mode:
12 Wider frequency operation, frequency selection (FDM),
13 multiple bandwidth, privacy, capability to be managed by
14 the head end.

15 So the notch in a single home mode is required,
16 so I would be able to use that same figure.

17 Q. So in your opinion, Figure 2 could be either
18 single home mode or connected home mode; right?

19 A. It says that the -- in the connected home mode
20 the notch filter is an option. So I could use that same
21 figure.

22 Q. How can you tell whether you're operating in
23 single home mode or connected home mode?

24 A. Well, in the single home mode, as I mentioned,
25 I've got one frequency that I can use, and I use the

1 transponder, so I transmit from the device to the
2 transponder. The transponder changes the frequency and
3 sends it back down.

4 If I'm in the home connected mode, I have to go
5 all the way up to the cable head end for management
6 purposes and so on, but I have a lot more frequencies that
7 I can use.

8 Q. Does the single home mode require the transponder
9 module?

10 MR. HALVERSON: Objection. Form.

11 THE WITNESS: Because we're dealing with a
12 frequency change, the spec says that you would use a
13 transponder to do that frequency change.

14 BY MR. PIROUZNIA:

15 Q. Can you operate in single home mode without a
16 transponder?

17 A. I don't know. I have not opined on that at all.
18 It just says that you use the transponder to do the
19 frequency change.

20 Q. Do you have to do the frequency change to operate
21 in single home mode?

22 A. Well, the way the single home mode is designed is
23 I transmit on one frequency and I receive on another. So
24 it changes the frequency to send it back down to the
25 receiving device. That way we prevent the collisions and

1 the interference and so on. That's what it's designed to
2 do.

3 Q. Can you use a transponder in connected home mode?

4 A. It's not designed to do that.

5 Q. Why is that?

6 A. Because it uses the head end to be able to -- so
7 I'm going to go up on the frequencies up to the cable head
8 end to do all the management and then the retransmission
9 down from there.

10 Q. Earlier we agreed that Figure 2 could be either
11 single home mode or connected home mode; right?

12 A. Correct.

13 Q. Do you see the cable modem shown in the middle of
14 Figure 2?

15 A. I see the home connected network interface and
16 the cable modem.

17 Is that what you're referring to, 206?

18 Q. Right.

19 A. I do.

20 Q. So we have a cable modem in Figure 2; right?

21 A. I beg your pardon?

22 Q. We have a cable modem in Figure 2; right?

23 A. There is a cable modem there.

24 Q. Is the cable modem the only device in Figure 2
25 that's communicating with the head end, or can any of the

1 terminal devices in Figure 2 communicate with the head
2 end?

3 A. It is my understanding that any one of the
4 devices would be able to transmit.

5 The purpose of the cable modem is to take the RF
6 that's coming down with the TV channels and configure them
7 and/or interface to the other devices.

8 Q. Can you flip to Figure 4 on page 3 of the Amit
9 reference?

10 A. I see it.

11 Q. Is Figure 4 operating in single home mode or
12 connected home mode, or can it be either one?

13 A. I'd have to take a look at what it's saying in
14 Amit.

15 Q. Please go ahead.

16 A. But the cable hub is kind of a replacement for
17 the RF splitter.

18 So Figure 4 -- on column 7, line No. 58, Figure 4
19 presents HomeCN with a local cable hub. A local cable hub
20 [401] connects to the HCNUs and the HCNIs. This system
21 is -- operates in single home operation mode.

22 Q. What is local cable hub 401?

23 MR. HALVERSON: Objection. Form.

24 THE WITNESS: It's a local cable hub. A hub
25 happens to be a central, like, use device that allows you

1 to connect other devices to it.

2 BY MR. PIROUZNIA:

3 Q. Is local cable hub inside somebody's home or is
4 that part of the service provider's network?

5 A. Well, if it's used as a single home-only network,
6 I would say this is going to be either at the point of
7 entry or inside the house.

8 Q. Earlier you read that single home mode requires a
9 notch filter; right?

10 A. I believe I did.

11 Q. I don't see a notch filter in Figure 4.
12 Do you?

13 A. Might be in the local hub. I don't know.

14 Q. In your opinion, Figure 4 would require a notch
15 filter because the spec tells us it's operating in single
16 home mode; right?

17 A. If, in fact, it says that it is a requirement,
18 then it might be enclosed in the hub, yeah.

19 Q. Well, you're saying if, in fact, it says it's a
20 requirement, but we read that a minute ago, didn't we?

21 A. Yeah. What I'm saying is we're saying that it
22 requires a notch filter. You're saying it doesn't show in
23 that picture. Well, the picture is designed to show you
24 just the local hub. The notch filter may very well be in
25 the local hub.

1 Q. Let's go back to Figure 2.

2 When Figure 2 is operating in single home mode,
3 the notch filter that said "optional" is no longer
4 optional; right?

5 A. Let me go back to column 6 where we were reading
6 about the connection.

7 So this is a preferred embodiment example of a
8 disclosed system. Figure 2 shows a home cable networking
9 (HCN) that has five nodes, and it is connected to the
10 regional cable TV plants via a cable [201]. The notch
11 filter [202] is a band reject filter that does not pass
12 certain RF range that is used by the home networking
13 devices. The filter improves the isolation between the
14 home network and other homes -- so it's designed to -- so
15 we're not going to interfere with other homes next door --
16 as well as the regional network.

17 Q. Earlier we agreed that single home mode requires
18 the notch filter; right?

19 A. I believe we did, yes.

20 Q. So for the network in Figure 2 to be operating in
21 single home mode, it would require that notch filter to be
22 present; right?

23 A. Correct.

24 Q. We can also agree that the even though the notch
25 filter's present, the network devices in Figure 2 can

1 still communicate with the regional CATV network; right?

2 A. Well, what I said is if we're dealing with a CATV
3 network, we have to be able to get or talk to that
4 network. It may be one down -- one way only down, but at
5 least we're still -- in a communications mode there's a
6 transmitter and a receiver. So I have to be able to get
7 the cable TV channels down and still be able to talk on
8 the LAN without interfering with the next-door neighbors
9 or another apartment, whatever the case might be.

10 Q. Is it possible that the LAN communications in
11 Figure 2 use one frequency range that the notch filter
12 keeps within the home, but that the communications to the
13 regional CATV network uses a different frequency range
14 that is not stopped by the notch filter?

15 A. Well, yeah. Our download frequencies are going
16 to be beyond the 42; 42 up to, like, 960 -- 860.

17 The uplink, which I'm not going to be using in a
18 single home mode here, is designed from channels 5
19 to 40 -- 5 megahertz to 42 megahertz. So it's possible
20 I'm still getting the signal down with the cable TV, the
21 channels, and I'm still not able to communicate up.

22 Q. Why can the terminal devices of Figure 2 not
23 communicate up to the regional CATV network on a different
24 frequency than the frequency used within the LAN itself?

25 A. Because the notch filter is not allowing me to

1 pass certain frequencies.

2 In a single home network I only have one
3 frequency. I'm going out to the transponder on one
4 frequency, so I will block that frequency from going up.

5 Q. So in your understanding of Figure 2, in the
6 single home mode only a single frequency is being used to
7 communicate between all the terminal devices in the LAN;
8 right?

9 A. Between the terminal devices.

10 I use a frequency to the transponder, which, in
11 turn, uses a different frequency from the transponder,
12 down to the devices.

13 Q. How do the terminal devices, such as the cable
14 modem in Figure 2, communicate with the regional CATV
15 network in single home mode?

16 A. In that case if I'm going to be communicating --
17 as I said, the cable modem might only be for receive only.
18 It's not allowing me to pass -- the notch filter is
19 stopping data from going up. So I'm building an isolated
20 network right here.

21 Q. And earlier you said connected home mode could
22 possibly work with a notch filter; right?

23 A. I believe I read that in the spec that said it
24 was an optional device.

25 Q. So how would the terminal devices in connected

1 home mode communicate with the regional CATV network if
2 the notch filter was present?

3 A. Well, the notch filter wouldn't be filtering
4 what's got to go up to the CMTS.

5 Q. And so in your understanding, the difference
6 between connected home mode and single home mode is that
7 connected home mode is using multiple frequencies; whereas
8 single home mode is only using one frequency, and that one
9 frequency is getting stopped by the notch filter; right?

10 A. By the transponder and the notch filter.

11 Q. Okay.

12 A. These are just embodiments. I mean, I'm sure
13 there's a whole host of other embodiments in here that we
14 haven't even touched upon yet.

15 Q. If you flip to page 39 of your declaration, in
16 the middle of paragraph 97 you discuss how Amit's single
17 home mode uses only one channel as its frequency range
18 from 900 to 906 megahertz; right?

19 A. Correct.

20 Q. And you cite to column 8, lines 20 to 30; right?

21 A. Okay. Okay.

22 Q. Column 8 at line 17 says, The preferred frequency
23 and the preferred frequency range are selected according
24 to the operation mode.

25 Right?

1 A. Correct.

2 Q. And then we have the table that you cited from 20
3 to 30 which lists these preferred frequency ranges; right?

4 A. Correct.

5 Q. So is it your understanding that single home mode
6 is limited to the 900 to 906 megahertz or that that is
7 just the preferred frequency range, and you can possibly
8 have a different frequency?

9 A. Well, it's the preferred frequency range, but I
10 believe in the text it says that is the -- the 900 to 906
11 is in a special frequency range in telecommunications.

12 We've been talking about different technologies
13 or whatever, and one of them was the wireless services.
14 We use what we call the ICN -- no. ISM, industrial,
15 scientific, and medical; ISM frequencies. Those range in
16 the 900 megahertz range, from 900 to 928 megahertz.

17 In LANs 2A walkie-talkies, microwave ovens, and
18 all that, they all use that same frequency.

19 Most of the frequency happens above the 906. So
20 the preferred method is 900 to 906 so that we're not,
21 again, running into a lot of interference from external
22 services.

23 Just because it's preferred doesn't mean it has
24 to be that, but Amit says that's my preferred way of doing
25 it.

1 Q. In your opinion, the teachings of Amit do not
2 limit the single home mode to the frequency range of
3 900 to 906 megahertz; right?

4 A. I believe it just says that's the preferred
5 method.

6 Q. In your opinion, are the teachings of Amit in the
7 single home mode limited to a single frequency, or could
8 it be expanded to multiple frequencies?

9 A. It says it's a single channel, 6.25 megahertz.
10 In cable TV technology we use 6-megahertz channel
11 widths, so everything is designed to run 6 megahertz
12 channel width. This is one channel, 900 to 906.

13 Q. Where are you pointing to as Amit teaching that
14 it's a single channel for single home mode?

15 A. Single home mode, it says the channel spacing is
16 6.25 megahertz and it says that it operates in the 900 to
17 906 megahertz. That's what the table is showing us. So
18 it's a single channel operating at 6.25 megahertz.

19 Q. And you're looking again at the table on
20 column 8; right?

21 A. That same column we were just reading.

22 Q. And didn't we agree that that was a preferred
23 frequency range?

24 So is it possible that Amit also envisions more
25 than just a 6.25 megahertz single channel for a single

1 home mode?

2 MR. HALVERSON: Objection. Form.

3 THE WITNESS: I don't believe I read that. I
4 think you're trying to read into the patent.

5 BY MR. PIROUZNIA:

6 Q. Well, if something is preferred, that means we're
7 not limited to it; right?

8 A. Well, preferred is preferred. That's the way we
9 prefer to have it operate.

10 You're right. I could probably develop -- not I,
11 but somebody could develop a box that operates at
12 20 megahertz. Who knows?

13 Q. Are you familiar with the patent law concept of a
14 preferred embodiment?

15 A. I'm not a patent lawyer, so I would claim
16 ignorance on that one.

17 Q. Have you ever heard of a preferred embodiment?

18 A. I've heard of preferred embodiments.

19 Q. Do you know whether or not a patent is supposed
20 to be limited to a preferred embodiment?

21 A. From what I understand --

22 MR. HALVERSON: Objection. Form.

23 THE WITNESS: Sorry.

24 From what I understand, preferred embodiments are
25 just ways of explaining some of the ways the system can be

1 used, but there may be others.

2 Am I correct?

3 BY MR. PIROUZNIA:

4 Q. That sounds right to me.

5 A. Okay.

6 Q. In your opinion, is the teaching of Amit in
7 column 8, the table from lines 20 to 30 -- is that a
8 preferred embodiment?

9 MR. HALVERSON: Objection. Form. Calls for a
10 legal conclusion.

11 THE WITNESS: Well, it says the preferred
12 frequency is as such. So that would be an embodiment of
13 what Amit is teaching as the preferred frequency, a
14 preferred embodiment.

15 BY MR. PIROUZNIA:

16 Q. In the interest of time I want to stick with Amit
17 instead of jumping references.

18 So if you wouldn't mind flipping ahead to
19 ground 1 in your declaration and specifically paragraph 40
20 (sic), which is on page 58.

21 MR. HALVERSON: What paragraph?

22 MR. PIROUZNIA: Sorry. Paragraph 140 on page 58.

23 THE WITNESS: Okay.

24 BY MR. PIROUZNIA:

25 Q. Now, this is the section of your declaration

1 about ground 1 and how Amit would not be modified to
2 include multicarrier modulation; right?

3 A. Correct.

4 Q. And in the middle of paragraph 140 you say, Use
5 of OFDM techniques predates Amit's system.

6 Right?

7 A. Predates Amit; correct.

8 Q. Those are the OFDM teachings we've been talking
9 about like Chioffi and Jacobsen and DSL; right?

10 A. Correct.

11 Q. You say, Amit chose not to implement OFDM onto
12 its LAN.

13 Right?

14 A. Correct.

15 Q. How do you know Amit was aware of OFDM at the
16 time of his invention?

17 A. Amit, in a specification, refers to his network
18 is designed not to interfere with ADSL. And we know that
19 the ADSL uses OFDM. So Amit would have been aware of
20 that.

21 As a matter of fact, in the HomePNA comparison I
22 think he -- is where he talked about it does not interfere
23 with DSL technologies.

24 Q. So in your opinion, Amit would have been aware of
25 OFDM and chose not to implement it into his coaxial LAN;

1 is that fair?

2 A. Correct.

3 Q. In your opinion, could Amit have added OFDM to
4 his invention if he wanted to?

5 MR. HALVERSON: Objection. Form.

6 THE WITNESS: That's a hypothetical that I don't
7 want to touch. I mean, it's -- Amit specifically states
8 he wants a simple, easy-to-use, easy-to-install capability
9 that the user can install. And I know I saw that
10 technol- -- or that verbiage in there.

11 So, in fact, what I say in my declaration is Amit
12 uses a typical home coaxial cable infrastructure, and
13 there's no basis in there to conclude that the existing
14 hardware in place of Amit's home networks would be capable
15 of it.

16 BY MR. PIROUZNIA:

17 Q. If you go back to paragraph 139, you mentioned
18 that there's no indication that other existing hardware,
19 like splitters and amplifiers, would be compatible with
20 multicarrier modulation; right?

21 A. Correct.

22 Q. What would cause a splitter to not be compatible
23 with multicarrier modulation?

24 A. Well, the splitters are using a single carrier
25 modulation technique as long -- you know, as well as a

1 cable TV network.

2 Multicarrier technology, then I probably would
3 have to go and get a different type of splitter with the
4 OFDM chips in and so on.

5 So there was no indication that other hardware
6 would do it.

7 Q. Is a coax splitter a passive or an active device?

8 A. A splitter can actually be either/or.

9 So it's an RF splitter that's going to use the
10 radiofrequency capabilities. So I'm using the carrier
11 that is being sent down to me.

12 Q. In a typical coax splitter that's in the walls of
13 your home, is that considered an active or a passive coax
14 splitter?

15 A. I don't know that there's a typical splitter
16 that's installed in walls in my home, but if I have a
17 splitter that's in my home, there could be either/or. It
18 depends on what -- what environment we're trying to run.

19 Are we just taking a single cable TV coaxial
20 cable in and just serving two TVs or are we trying to
21 service all these other devices on different taps?

22 Q. One of the goals of the 249 patent was to
23 leverage the existing coax infrastructure that was already
24 in people's homes from cable TV service; right?

25 A. Correct.

1 Q. That existing coax cable TV structure in the
2 homes used passive splitters to go to each of the taps in
3 bedrooms and such; right?

4 A. Probably. Maybe.

5 Q. Would a passive splitter, from the time of the
6 249 patent, care whether I was sending single carrier or
7 multicarrier modulation to it?

8 A. What the 249 was trying to do or was going to do
9 was to provide this tap port-to-port isolation, so that
10 would be more active rather than passive.

11 Q. Why do you say that?

12 A. Because I'm isolating the different ports that
13 are on the splitter in that tap.

14 Q. So in your opinion, the splitters discussed in
15 the 249 patent are active splitters and not passive
16 splitters?

17 A. Yeah.

18 Q. And back to my question, if we were only dealing
19 with passive splitters, would they be agnostic to whether
20 I'm sending single carrier or multicarrier modulation
21 through them or would they care?

22 A. Well, I'm just thinking in terms of, you know,
23 where Jacobsen was looking at using the OFDM versus the
24 single carrier modulation, and her whole comment was
25 single carrier modulation with equalization is far more

1 complex, and she was recommending going in an OFDM
2 environment.

3 So I think the splitters using a single carrier
4 modulation are different than the ones that would use
5 OFDM.

6 I think I answered your question, but I kind of
7 got a round circle there.

8 Q. I'm a little confused why Jacobsen's teachings
9 relate to splitters, so maybe you can help me understand
10 that.

11 A. Well, I mean, when we're talking about using the
12 modulation into our devices, effectively whether it's a
13 single carrier or whether it's an OFDM, a multicarrier
14 modulation technique, we still have to be able to pump it
15 to the devices that are going to receive it.

16 She was looking at coming up with a technique
17 that would allow us to do the multicarrier modulation,
18 because the single carrier modulation with equalizers was
19 very complex and inefficient.

20 So I would think that because it's inefficient,
21 it would be different than what would -- I don't think
22 they'd be agnostic.

23 Q. I guess I'm confused with how Jacobsen's
24 comparison of single carrier with equalization and
25 multicarrier relates to the splitters.

1 A. Well, again, the splitter is an RF splitter
2 that's coming down here, and I now have to pump the data.

3 I'm going to take the data that's coming in, I'm
4 going to split it, and I'm going to send the same data to
5 all of the devices.

6 If, in fact, we're dealing with the 249, as an
7 example, we want to isolate the ports. So I don't have to
8 send TV signals that wouldn't be used, let's say, at a PC.
9 I'm going to isolate the ports.

10 Jacobsen basically was saying, hey, we can let it
11 rip.

12 Q. So in your opinion, a passive splitter would care
13 whether I'm sending single carrier or multicarrier
14 modulation through it? Do I have that right?

15 A. I believe with the RF signalling and so on, it
16 would, yeah.

17 Q. Okay. How about amplifiers?

18 In your opinion, would an amplifier care whether
19 I'm sending single carrier or multicarrier modulation
20 through it at the time of the 249 patent?

21 A. Well, I'm going to amplify a signal -- let me
22 just withdraw on that one.

23 I didn't look at that side of it. I didn't even
24 think about what an amplifier would do.

25 Q. So you're not sure one way or another whether --

1 A. Correct.

2 Q. -- an amplifier would care whether it's
3 multicarrier or single carrier modulation?

4 A. Correct.

5 Q. Let's flip to paragraph 167.

6 And I apologize for speeding up. I'm just trying
7 to do so in the interest of time.

8 But that's on page 66, and please let me know
9 when you're there.

10 A. I'm there.

11 Q. In paragraph 167 you refer to HomePNA; right?

12 A. Correct.

13 Q. What is HomePNA?

14 A. I don't remember the acronym, but HomePNA was a
15 twisted pair wiring system that was used, and I believe
16 that was developed by AT&T. Okay. So it used existing
17 telephone wires to transmit LAN-type communications.

18 Q. So HomePNA used your existing telephone wires in
19 your home to create a LAN in your home --

20 A. To create --

21 Q. -- is that right?

22 A. Yeah.

23 Q. Were you familiar with HomePNA prior to this
24 case?

25 A. Yes. I was doing some work with Cisco systems

1 several years ago, and one of the systems that they were
2 competing with was HomePNA.

3 Q. Was that back in the 1990s?

4 A. Late '90s, early 2000s. I don't remember the
5 dates.

6 Q. Was Cisco's competitive system also using
7 telephone wires to create a LAN?

8 A. Yes.

9 MR. HALVERSON: Objection. Form.

10 BY MR. PIROUZNIA:

11 Q. Does HomePNA use OFDM?

12 A. I think it was using the telephone frequencies
13 that would have been using ADSL capability.

14 So what it says is the prior system that
15 interfered with DSL technologies, HomePNA utilized
16 existing telephone wiring, which was Exhibit 105 (sic),
17 that Amit described.

18 The benefits highlighted in Amit's system, that
19 it does not interfere with ADSL and VDSL, so... because it
20 uses a different medium and frequencies than those two
21 systems.

22 Q. Do you know whether or not HomePNA used OFDM?

23 A. Well, if it says it does not interfere with ADSL
24 and VDSL, it sounds to me like it was using OFDM
25 capabilities.

1 Q. Do you know whether or not HomePNA used TDD?

2 A. I don't believe it did, but I can't say for sure.

3 Q. Do you know if HomePNA used equalizers?

4 A. Again, I don't remember enough about HomePNA to
5 really talk to it.

6 Q. In paragraph 173 you state that, Amit will set
7 the modulation method after determining the static factors
8 that impact the channel.

9 Do you see that?

10 A. Yep.

11 Q. What do you mean by "static factors"?

12 A. Well, Amit basically says, I can set the
13 modulation technique.

14 Let's say I was using, for the sake of arguing,
15 QAM 16. Nowhere does it say that based on the channel
16 conditions or anything else, that we're going to change
17 it.

18 Amit basically says, We're going to set the
19 modulation, and it's going to stay there.

20 If I can just read further on that one chapter,
21 it says, The modulation method may be set based on the
22 quality and length of the connective cabling, the impact
23 of splitters on the channel. The modulation method, once
24 set, would not change.

25 That's what I read in Amit.

1 Q. Why would the splitters impact the modulation
2 method Amit chooses?

3 A. Well, they get different degradation as they're
4 passing through the splitters.

5 Q. If you flip to the next page, in paragraph 177
6 you refer to the houses where there's a problem with
7 reflection, which is referred to in Amit in the next
8 sentence of your declaration.

9 Do you see that?

10 A. Yes.

11 Q. What does it mean to have a problem with
12 reflection?

13 A. Well, the reflection back into a system. If I'm
14 transmitting and it reflects back, I'm going to cause
15 interference. And I can have ISI on that one, too.

16 Q. How does the problem with reflection differ from
17 the constructive use of reflection to communicate between
18 two terminal devices?

19 A. If I wasn't using a system that wanted that
20 reflection or if the reflection was way too high, that
21 would be different than what I tried to design into my
22 network.

23 Q. What does it mean for a reflection to be too
24 high?

25 A. Well, the signal -- what is being reflected back,

1 the signal strength.

2 Q. So the reflected signal is greater than the
3 original signal?

4 Is that what you're saying?

5 A. No. But greater than the new incoming signal.

6 Q. In paragraph 181 you also refer to an echo
7 problem; right?

8 A. Correct.

9 Q. Is the echo problem the same as the problem with
10 reflection we just talked about?

11 A. Well, an echo problem, typically what happens is,
12 yeah, we're getting a -- it's a repeat. It's kind of a --
13 there was an example used -- oh, I'm trying to think of
14 where I saw the example, but there was an example of a
15 ripple effect that would take place; the echo. I'm
16 transmitting the data and I'm getting a little bit of an
17 echo right behind it.

18 I think we also used to use that in the cable TV
19 world where you might get a ghost on a picture, because
20 I'm getting the signal and I'm getting the echo right
21 behind it.

22 Q. If we go to the next page, in paragraph 182,
23 that's where you talk about the transponder module we were
24 talking about earlier today; right?

25 A. Correct.

1 Q. And I think we agreed that the transponder was
2 only used in the single home mode and not the connected
3 home mode; right?

4 A. Correct.

5 Q. One second.

6 If you go back to Amit, Exhibit 1005, in
7 column 20, in line 52 you'll see it's described that the
8 transponder can be powered down.

9 Please let me know if you see that.

10 A. Column 20, line?

11 Q. 52.

12 A. 52. Thank you.

13 I see what it says. The transponder can be
14 powered down even from remote, and the system returns to
15 the initial model. This ability may be very important to
16 a cable operator.

17 Q. What would happen if the transponder was powered
18 down in the single home network of Amit?

19 A. If it would be powered totally down? When I
20 transmit to it, nothing would come out.

21 Q. Would we still have a reflection that we would be
22 able to communicate on if the transponder was powered
23 down?

24 A. I don't know. I haven't considered that.

25 Q. Would -- in your opinion, would the single home

1 mode of Amit be able to provide a LAN if the transponder
2 was powered down?

3 A. I don't know, to be honest. Essentially, I do
4 recall Amit saying you can't operate in a home connected
5 and the single mode method at the same time, but I don't
6 know that they explain anything beyond that.

7 Q. In your expert opinion, would the single home
8 mode LAN work if the transponder was powered down?

9 A. If I need --

10 MR. HALVERSON: Objection. Form.

11 THE WITNESS: If I need the transponder to send
12 the data back down and the transponder is not there, then
13 the single home mode would not work.

14 BY MR. PIROUZNIA:

15 Q. I think that's a "no." But you agree --

16 A. Yeah. It's a not --

17 MR. HALVERSON: Same objection.

18 THE WITNESS: Definitely not.

19 BY MR. PIROUZNIA:

20 Q. I've got just a little bit more on Amit, and then
21 I want to briefly hit Jacobsen. Then I'll be done with
22 you, and your counsel can ask any follow-up questions he
23 has. But --

24 MR. HALVERSON: Can we take a break right now?

25 MR. PIROUZNIA: Yeah. Sure.

1 (A recess was taken at 3:07 p.m.)

2 THE COURT REPORTER: Victor, do you want a rough
3 or an expedite?

4 MR. PALACE: No. That's all right.

5 (The recess ended at 3:12 p.m.)

6 BY MR. PIROUZNIA:

7 Q. Mr. Bates, if you wouldn't mind flipping to
8 paragraph 186, page 72 of your declaration.

9 A. Okay.

10 Q. You mentioned that the CATV systems, at the time
11 of the 249 patent, performed equalization by having the
12 CMTS perform a pre-equalization; right?

13 A. Correct.

14 Q. Is pre-equalization a form of equalization?

15 A. I would say yes.

16 Q. When did you first encounter pre-equalization?

17 A. I really don't remember time-wise.

18 Q. Earlier we talked about how equalization has been
19 known for a while.

20 Would those opinions also apply to
21 pre-equalization or not necessarily?

22 A. Well, implementations of cable TV systems started
23 a long time ago. So when they would have come to a
24 pre-equalization performance or whether they just used
25 equalization first, it would take -- if we're saying that

1 the CMTS is going to perform that pre-equalization, then
2 obviously the CMTS would have had to evolve to be able to
3 do that. As opposed to just doing equalization on the
4 line, it could do a pre-equalization upfront.

5 So I don't really know exactly when they started
6 implementing it.

7 Q. Is the difference between pre-equalization and
8 equalization just that pre-equalization occurs before
9 transmission instead of upon reception?

10 A. That would have been the intent.

11 Q. Were the terminal devices, at the time of the
12 249 patent, also able to perform pre-equalization when
13 they were communicating back to the CMTS?

14 A. We were expecting -- I'm sorry.

15 Can you say that again?

16 Q. Yeah.

17 So I think we -- your declaration talks about how
18 the CMTS performs pre-equalization on the transmissions to
19 the terminal devices; right?

20 A. Correct.

21 Q. When the terminal devices are communicating back
22 to the CMTS, are they able to perform pre-equalization, as
23 well, at the time of the 249 patent?

24 A. The 249, as I understand it, would put the
25 intelligence in the terminal devices. So they would be

1 able to provide either equalization, or if we're saying
2 pre-equalization, going back up.

3 It's -- the 249 is all about the terminal devices
4 being able to do these things: the OFDM, the
5 equalization, mitigating the ISI-type systems along the
6 way; whereas prior to that it was something else that had
7 to take it -- had to do this.

8 Q. So in your opinion, prior to the 249 patent,
9 pre-equalization was or was not performed in the terminal
10 devices?

11 A. Prior to the 249? I'm saying it wouldn't have
12 been done in Amit.

13 Q. And generally it wouldn't have been done in
14 terminal devices prior to the 249 patent?

15 Is that your opinion?

16 A. Yes. I'm saying there's no evidence that any one
17 of Amit's terminal devices, but I guess we can say across
18 the board it --

19 Q. Well, yeah.

20 What if we looked at your coax LAN you developed
21 at the chemical company; right?

22 A. Correct.

23 Q. Did that LAN use pre-equalization?

24 A. Not to my recollection.

25 Q. Did any of the coax networks you worked on use

1 pre-equalization in your career?

2 A. If we were working with a cable company, they
3 might have been doing it. Because the CMTS would have
4 been smart enough -- so the CMTS would be smart enough to
5 be able to provide it because of the intelligence.

6 The terminal devices back then -- I think I
7 mentioned terminals could have been dumb terminals, so as
8 a result, they wouldn't have been able to do much of
9 anything other than you would be able to key into it.

10 Using the 249, we're moving all of that
11 intelligence and all of that capability down to the
12 terminal device.

13 Q. Did you encounter pre-equalization on your work
14 in cellular communications?

15 A. There may have been some. You know, from a base
16 station type environment we may have run into it, yeah.

17 Q. Did -- did you ever encounter mobile devices
18 themselves doing pre-equalization with communicating back
19 to a base station?

20 A. To my best recollection, I don't know.

21 Q. I just want to briefly ask you a little bit about
22 Jacobsen, which is Exhibit 1007, and it's in volume 2 of
23 your binders.

24 A. I'm in.

25 Q. All right. Earlier we talked about how Jacobsen

1 compares single carrier modulation with equalization with
2 multicarrier modulation; right?

3 A. Correct.

4 Q. For single carrier modulation with equalization,
5 is the equalization occurring at the terminal devices in
6 Jacobsen?

7 MR. HALVERSON: Objection. Form.

8 THE WITNESS: Jacobsen doesn't actually say where
9 it's taking place.

10 BY MR. PIROUZNIA:

11 Q. When you, as an expert, are reading Jacobsen,
12 where do you understand the equalization to be occurring?

13 A. If I had to think about it that way, I would say
14 it could probably be done at the head end on down as
15 opposed to on the way up because the terminal devices
16 would be much, much less sophisticated.

17 Q. For the multicarrier modulation of Jacobsen, what
18 role does the receiver play in the multicarrier modulation
19 scheme?

20 A. Well, as I had mentioned before, when we're ready
21 to send, we use the IFFT. When we receive the signal, we
22 do just the opposite. We reverse the whole process.

23 So the multicarrier modulation at the receiving
24 device uses the FFT.

25 Q. And Jacobsen talks about the bit distribution

1 being continuously updated during transmission as the
2 receiver sends the required information to the transmitter
3 on secure overhead channels; right?

4 A. I'm assuming you were reading something.

5 Q. Yeah. I'm reading from my outline. But it's in
6 page 307 in the left column if you want to make sure I'm
7 reading it right.

8 So in the middle of that paragraph it says,
9 Because the bit distribution is continuously updated
10 during transmission as the receiver sends the required
11 information to the transmitter on secure overhead
12 channels.

13 Do you see that?

14 A. Yes.

15 Q. So the receivers of Jacobsen are providing
16 feedback to the transmitters that determine how many bits
17 to allocate to each subchannel; right?

18 A. Based on different channel conditions, yes.

19 Q. And when Jacobsen refers to the "receiver," is
20 Jacobsen referring to a terminal device?

21 A. In Jacobsen, again, she was looking at the head
22 end and the user device -- end user device; not the
23 terminal device, but where we were terminating at the
24 cable entry. So Jacobsen never looked beyond the entry to
25 the building.

1 Q. So what receiver is Jacobsen referring to?

2 A. Whatever the device is, whatever the cable modem
3 or whatever termination we have at the point of entry.

4 Q. Wouldn't that cable modem be a terminal device?

5 A. Depends on the -- what it's doing. But we don't
6 typically think that the cable -- when I refer to "cable
7 modem," we're talking about a cable system that was raw
8 without a LAN. She never looked beyond the inside of the
9 building. So in that case it's a termination device.

10 Q. In your opinion, does Jacobsen envision using
11 equalization with multicarrier modulation?

12 A. I don't believe she was doing that.

13 What she basically said, that equalization, along
14 with single carrier modulation, is far less efficient, far
15 more mathematical computation requirements, and so on.
16 And therefore, she was pushing for the OFDM.

17 Q. If you flip to page 309 of Jacobsen, there's a
18 footnote 4. I'd like you to review it, if you don't mind.

19 A. Okay.

20 Q. Are you familiar with footnote 4?

21 A. I'm familiar with using the time delay
22 equalization capabilities.

23 Q. And is Jacobsen saying in footnote 4 that we can
24 use time domain equalization with our FFTs in multicarrier
25 modulation?

1 A. That appears to be what she's saying, yes.

2 Q. So in your opinion, does Jacobsen envision using
3 equalization with multicarrier modulation?

4 A. I believe what she said was this is a way we can
5 reduce the size of the FFT. And that's beyond the scope
6 of what she was trying to cover here.

7 Q. Would you at least agree that Jacobsen doesn't
8 teach away from using equalization with multicarrier
9 modulation?

10 A. I'm not a lawyer, and "teaching away" is a
11 concept that I'm just not comfortable with.

12 Q. Would you agree that Jacobsen doesn't discourage
13 the use of multicarrier modulation with equalization?

14 MR. HALVERSON: Objection. Form.

15 THE WITNESS: It sounds like what she's really
16 doing is just saying, hey, here's an option that we could
17 have used. But it wasn't one she was using. So it just
18 sounds like she was just throwing out a, hey, by the way.

19 BY MR. PIROUZNIA:

20 Q. Is it surprising to you that Jacobsen would refer
21 to the use of time domain equalization in combination with
22 multicarrier modulation?

23 A. I'm not surprised or not unsurprised. I'm just
24 neutral on that.

25 Q. At the time of Jacobsen was it common to use

1 equalization with multicarrier modulation?

2 MR. HALVERSON: Objection. Form.

3 THE WITNESS: I believe it could have been
4 unique, but I don't know how common it would have been.

5 MR. PIROUZNIA: I think that's it for me, so I'm
6 going to pass you over to your counsel for any questions
7 he has.

8 MR. HALVERSON: Sounds good.

9 Let's take a break.

10 (A recess was taken from 3:26 p.m. until
11 3:32 p.m.)

12

13 EXAMINATION

14 BY MR. HALVERSON:

15 Q. Mr. Bates, just a couple of questions.

16 Do you recall talking this morning about the chem
17 campus installation that you did?

18 A. Yes.

19 Q. What managed the communications in that
20 installation on the coax?

21 A. We had an RF controller. It was a host computer
22 that sat at the -- the equipment of a CMTS.

23 Q. And what kind of terminal devices were being used
24 in that installation?

25 A. Well, down at the desktop, at the user level, we

1 had dumb terminals because, as I mentioned, we had
2 IBM SNA SDLC. The host computer sent the data down to the
3 controller. The controller, therefore, forwarded out to
4 the dumb terminals on the desktop. So it was really just
5 a keyboard and a screen.

6 Q. So could those keyboard and screens perform
7 equalization on signals?

8 A. No. They were dumb. They had no intelligence
9 whatsoever.

10 Q. Could they do FFTs?

11 A. No.

12 Q. You spent some time this morning talking about
13 work experience in coax.

14 Approximately how much time have you spent over
15 your 50 years working on coaxial networks?

16 A. Better than 40-plus percent. You know, I never
17 really looked at it that way because I built -- I built
18 networks with fibers. I built networks with twisted pair,
19 T1s, and coaxial cables.

20 I'll give you just an anecdotal response, though,
21 in Ethernet. When we talk about the Ethernet systems,
22 when I was the CIO at that law firm, we were moving from
23 one building to another. And I needed to be able to run
24 cables -- Ethernet cables from the 28th floor down to the
25 2nd floor where I had my mainframe computer.

1 The only way I could find a way down was to ride
2 on top of an elevator at night and pull the cables and
3 attach them to the walls on the way down, because OSHA
4 would not give us permission to run the cables.

5 So anecdotally, I have these things that I've
6 done that most other people have never experienced.

7 MR. HALVERSON: I think that is it for me pending
8 anything else from Aaron.

9 MR. PIROUZNIA: Nothing further from me.
10 We can go off the record.

11 THE WITNESS: Okay.

12 MR. HALVERSON: I would love a rough.

13 THE COURT REPORTER: You both have a standing
14 order for a rough and regular delivery for final.

15 Is that okay for both of you?

16 MR. HALVERSON: Yes. That's perfect.

17 MR. PIROUZNIA: Yes. Thank you.

18 (The deposition concluded at 3:36 p.m.)

19
20
21
22
23
24
25

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

I, the undersigned, say that I have read the foregoing transcript of testimony taken January 7, 2025, and I declare, under penalty of perjury, that the foregoing is a true and correct transcript of my testimony contained therein.

EXECUTED this _____ day of _____,
2025.

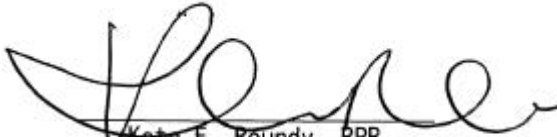
REGIS J. BATES, JR.

1 STATE OF ARIZONA)
) ss.
2 COUNTY OF MARICOPA)

3 BE IT KNOWN that the foregoing deposition was
4 taken by me pursuant to stipulation of counsel; that I was
5 then and there a Certified Court Reporter of the State of
6 Arizona, and by virtue thereof authorized to administer an
7 oath; that the witness before testifying was duly sworn by
8 me to testify to the whole truth; pursuant to request,
9 notification was provided that the notice was provided
10 that the transcript was available for signature by the
11 deponent; that the questions propounded by counsel and the
12 answers of the witness thereto were taken down by me in
13 shorthand and thereafter transcribed into typewriting
14 under my direction; that the foregoing pages are a full,
15 true, and accurate transcript of all proceedings and
16 testimony had and adduced upon the taking of said
17 deposition, all done to the best of my skill and ability.

18 I FURTHER CERTIFY that I am in no way related to nor
19 employed by any of the parties hereto nor am I in any way
20 interested in the outcome hereof.

21 DATED at Phoenix, Arizona, 19th day of January 2025.

22
23 
24 Kate E. Roundy, RPR
 Certified Reporter #50582
25

1	LAWYER'S NOTES		
2	PAGE	LINE	
3	_____	_____	_____
4	_____	_____	_____
5	_____	_____	_____
6	_____	_____	_____
7	_____	_____	_____
8	_____	_____	_____
9	_____	_____	_____
10	_____	_____	_____
11	_____	_____	_____
12	_____	_____	_____
13	_____	_____	_____
14	_____	_____	_____
15	_____	_____	_____
16	_____	_____	_____
17	_____	_____	_____
18	_____	_____	_____
19	_____	_____	_____
20	_____	_____	_____
21	_____	_____	_____
22	_____	_____	_____
23	_____	_____	_____
24	_____	_____	_____
25	_____	_____	_____

1 INSTRUCTIONS TO WITNESS

2

3 Please read your deposition over carefully
4 and make any necessary corrections. You
5 should state the reason in the appropriate
6 space on the errata sheet for any corrections
7 that are made.

8 After doing so, please sign the errata
9 sheet and date it.

10 You are signing same subject to the changes
11 you have noted on the errata sheet, which
12 will be attached to your deposition.

13 It is imperative that you return the
14 original errata sheet to the deposing
15 attorney within thirty (30) days of
16 receipt of the deposition transcript by
17 you. If you fail to do so, the deposition
18 transcript may be deemed to be accurate
19 and may be used in court.

20

21

22

23

24

25

	ERRATA SHEET		
	PAGE --	LINE --	CORRECTION/REASON
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

	ERRATA SHEET		
	PAGE --	LINE --	CORRECTION/REASON
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			