

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

3 SILICON LABORATORIES, §
4 INC., §
5 §
6 Petitioner, §
7 § IPR 2014-00881
8 § IPR 2014-00728
9 VS. § IPR 2014-00809
10 §
11 §
12 §
13 CRESTA TECHNOLOGY §
14 CORPORATION, §
15 §
16 Patent Owner. §

17 ORAL DEPOSITION OF DOUGLAS R. HOLBERG, PH.D.
18 DECEMBER 17, 2014
19 VOLUME 1 OF 2

20 ORAL DEPOSITION OF DOUGLAS R. HOLBERG, PH.D.,
21 produced as a witness at the instance of the Patent Holder
22 and duly sworn, was taken in the above styled and numbered
23 cause on Wednesday, December 17, 2014, from 9:03 a.m. to
24 5:01p.m., before Tamara Chapman, CSR, RPR, CCR (LA) in
25 and for the State of Texas, reported by computerized
stenotype machine, at the offices of Lee & Hayes,
13809 Research Boulevard, Suite 405, Austin, Texas,
pursuant to the 37 CFR Section 42.53.
Job # 87766

A P P E A R A N C E S

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1 DOUGLAS HOLBERG, Ph.D. - 12/17/14

2 THE REPORTER: Today is December 17, 2014.

3 The time is approximately 9:03 a.m. We are located at
4 Lee & Hayes, 13809 Research Boulevard, Suite 405, Austin,
5 Texas.

6 This is the deposition of DOUGLAS R.
7 HOLBERG, Ph.D..

8 My name is Tamara Chapman, certified
9 shorthand reporter, representing TSG REPORTING, 747 Third
10 Avenue, New York, New York.

11 Will all persons present please state their
12 appearances and whom they represent, and then I will swear
13 in the witness.

14 MR. FLEMING: I'm Mike Fleming. I'm the
15 attorney for Cresta Corporation.

16 MR. HAHl: I'm Robert Hahl with Cresta
17 Technologies.

18 MR. MURGULESCU: My name is Mihai Murgulescu
19 for the patent owner.

20 MR. AYERS: Peter Ayers and Brian Mangum on
21 behalf of the petitioner Silicon Laboratories, Inc.

22 THE WITNESS: And Douglas Holberg on behalf
23 of Silicon Labs, Inc.

24 DOUGLAS R. HOLBERG, Ph.D.,
25 having been first duly sworn, testified as follows:

DOUGLAS HOLBERG, Ph.D. - 12/17/14

EXAMINATION

BY MR. FLEMING:

Q. Dr. Holberg, have you ever done this before, taken a deposition?

A. Once before.

Q. Once before. And what kind of proceeding was that for?

A. It was a -- a lawsuit, a patent lawsuit between Silicon Labs and Analog Devices.

Q. And was that a District Court case?

A. I don't remember.

Q. Maybe I should just talk a little bit about the ground rules. It will be important that only one person speak at a time so that the court reporter can properly get it down.

Another thing is, you're under oath, so you're to answer questions directly to me and not to other parties.

Also remember, you're under oath even when we take a break. So you're not to discuss the case outside the room.

So is there any questions you have about the deposition?

A. Not at this point.

Q. If I ask you a question and you don't understand

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2 it, it would be important that you ask me to rephrase the
3 question or to repeat the question. But you're not to ask
4 anyone else in the room about the question during the
5 deposition.

6 A. Okay.

7 Q. The other aspect that's unusual about this kind
8 of deposition, it's a deposition which is part of the
9 patent office. So this is not a district court type
10 deposition. And one of the main differences is, is that
11 there might be an objection raised, but that -- you still
12 are to answer the question.

13 A. Okay.

14 Q. So do you feel fully prepared to testify today?

15 A. Yes, I do.

16 Q. Is there anything that would you prevent you from
17 giving full and complete and accurate testimony today?

18 A. No.

19 Q. Do you understand the oath that you've taken to
20 tell the truth?

21 A. Yes.

22 Q. Do you promise to tell the truth today?

23 A. Yes, I do.

24 Q. So let's go to the first exhibit. So it would be
25 Exhibit 2044.

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This is Exhibit 2044. Do you recognize this exhibit?

A. Yes, I do.

MR. AYERS: And just so the record's clear, it's Exhibit 2044 in which matter? I know this is a single transcript, but the exhibit numbers are different, are they not, between the various matters?

MR. FLEMING: No, Peter, they'll all be the same --

MR. AYERS: Okay.

MR. FLEMING: -- for the deposition --

MR. AYERS: Okay.

MR. FLEMING: -- to make it easy.

MR. AYERS: Okay.

MR. FLEMING: And if they do translate to something different for each IPR, I'll make it clear on the exhibit list.

MR. AYERS: Perfect. Thank you.

MR. FLEMING: But I thought for this deposition, it would be easier just to have one exhibit number for the whole proceeding.

MR. AYERS: Certainly. I just wanted to make sure. Thank you.

Q. (BY MR. FLEMING) Dr. Holberg, do you recognize

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Exhibit 2044?

A. Yes, I do.

Q. Can you tell me what it is?

A. It looks like it is my CV, résumé, if you will.

Q. Uh-huh. I notice that you -- from 2008 until now you're a principal and intellectual property technical consultant, is that a corporation or is that a --

A. No.

Q. So it's a -- you're acting as a consultant?

A. Yes.

Q. What -- what is a intellectual property technical consultant?

A. Well, the type of work I do includes analysis of patents for clients. For example, a client might ask me to review a patent and rate it with some metrics that they would give me. And then that process would lead me then to, you know, read and understand the patent from a -- really a technical point of view and understand, for example, things like how easy would it be to de- -- to detect it. I might even make, you know, use- -- how useful it would be. But most of the time, if not always, I'm given a set of metrics to -- to make a judgment.

Other things that I might do is, my client might ask me to target a -- a company and say, "See if you can

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take our portfolio and read it on the products of a specific company." That would entail a lot of things. It would -- you know, researching the company, researching their product line, reading their data sheets, buying their products, reverse engineering them, analyzing the circuits that have been reversed. And then providing back to the client a read of, you know, how their -- their claims might read on those products or the circuits within those products.

A client might ask me to assist them when they're on the other side of that relationship, when a company is -- all the case -- virtually -- well, no. Some -- some of these cases are just in the licensing realm versus litigation. No suits have been filed. So the analysis that I would do as I target a company might then result in my client approaching the target on -- with licensing terms. And -- and so I would be, perhaps, out of the loop once it reaches that stage.

And on -- as I was going on the defensive side, then I would be charged by my client to show -- help assist them from a technical perspective to show noninfringement or -- and/or -- or "and" help them with perhaps an invalidity argument.

All the time that I've been doing this, I'm

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always tethered pretty tightly to a -- an attorney or a group of attorneys, in fact, which guide me on the -- from the legal perspective. I'm a technical guy. So I feed my analysis to the attorneys, and then they cast it from a perspective of the best way to present it.

What else does this entail? I think that pretty much captures it all. And this -- of course, the -- the process I'm in now is included in that. I've never done an IPR before. This is my first opportunity to do that.

Q. Had you been involved in several cases having to do with validity of a claim?

A. Yes.

Q. I also noticed on your CV that you were an employee of Silicon Laboratories. Can you tell me what your role there was?

A. I was -- I started a company in 1999, Cygnal, as shown there in the CV, and I was the -- as -- as well as founder, cofounder, I was the VP of engineering and CTO.

So in 2003 we were acquired by Silicon Labs, and I came over as an employee as part of that transaction. Initially I was -- remained as kind of an ambiguous role of just the head of the engineering for the group that I brought over. But not too long after that, I was promoted to VP of technology at Silicon Labs.

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2 Q. And what was your responsibilities as VP of
3 technology?

4 A. Primarily I was -- I maintained some management
5 over the MCU group that I -- came over, but primarily my
6 role moved into the computer-aided design area.

7 So what I was trying to do, which was what our
8 really niche area at Cygnal was, was developing
9 methodologies for -- for bringing integrated circuits to
10 fruition, basically. I had worked a lot with my team to
11 develop methods where it would minimize the -- the time it
12 would take to actually assemble chips that would be then
13 be manufactured. And so we were -- we were taping out
14 chips like every four months, which was pretty phenomenal.

15 So Silicon Labs, I think, recognized the value of
16 that skill. And all of this really relates very strongly
17 to the computer-aided design and the toolset that you use.
18 And so they asked me if I would try to transfer that
19 technology, if you will, that approach to design into the
20 culture of Silicon Labs.

21 So I was -- I came -- basically I was the CAD
22 manager for the company. And in that role, you know, I --
23 the CAD team reported to me. I negotiated contracts with
24 Cadence and -- and, you know, so it was a -- it was a --
25 it was different than design.

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2 But I still had -- even though I had that, I
3 still had the --

4 Q. It was different than design. Can you explain?

5 A. Well, I wasn't -- I wasn't designing circuits --

6 Q. Okay.

7 A. -- and I wasn't -- I wasn't directing the
8 designers. But I had -- one project that I had that was
9 kind of a holdover from the transition in terms of my
10 vision. One of my visions at Cygnal was to take the MCU
11 into the wireless domain, and I thought the best vehicle
12 for that would be the Zigbee standard, and so we were
13 pushing hard to either buy the technology or develop it.

14 Q. For the record, could you tell us what MCU stands
15 for?

16 A. Oh. It's microcontrollers.

17 Q. Uh-huh.

18 A. And so when I came over to Silicon Labs, one of
19 the first things they did was they acquired a little
20 company in France that was basically four guys that were
21 doing wireless design.

22 And so the -- the French group reported to me.
23 And I -- and what we tried to then -- what we then started
24 working on was a -- a Zigbee product that was going to be
25 integrated with the MCU.

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Q. So you would characterize your expertise, then, in -- in integration?

MR. AYERS: Objection; form.

A. I -- I have a broad skill set, as disclosed in this -- this -- my CV. That's one of them.

Q. (BY MR. FLEMING) Were you involved in any way in the design of the Silicon Labs' television receiver?

A. No, I was not.

Q. Were you directly involved in any design of RF circuitry?

A. Directly, as I just said, there was a group that reported to me. I was not doing the design.

Q. Okay. I noticed that you were also a professor --

A. Yes.

Q. -- at the University of Texas, of technology?

A. That would be the University of Texas.

Q. That is the University of Texas.

A. Right.

Q. Can you tell me what you did there? You were an adjunct?

A. Adjunct. That is correct.

Q. Can you tell me what you taught there?

A. I taught the course CMOS Analog Circuit Design.

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Q. So you didn't teach anything directed to RF digital design?

A. I did not --

MR. AYERS: Objection; form.

Excuse me.

A. I did not teach a course on RF digital design.

Q. (BY MR. FLEMING) Did you do any research while you were there?

A. No.

Q. So how many courses would you typically teach in a semester?

A. I taught one course per semester.

Q. And it was --

A. CMOS Analog.

Actually, I'm trying to think. I may have -- I think I taught it every term. I'm not 100 percent sure that I taught it every term, but...

Q. Every term from the period of when to when?

A. Well, I'm assuming what I wrote here was correct. It was '95 to 2001. So I think in the beginning that I may have just taught it once, you know, maybe in the fall term. But sometime during the course of this, the -- it was so popular that I started teaching it more often, I think. So, you know, I can't -- I can't say for sure. I

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mean, I have that documentation.

Q. But you haven't taught since 2000?

A. No, I have not.

Q. Tell me more about your company that you founded, Cygnal Integrated Products.

A. Yeah. The -- the premise was to -- you know, to develop a product and -- and that would do capture, compute, communicate. That was -- that was the -- kind of the elevator speech.

The capturing element of that -- of that product, that entire product line, was on the sense side. You have A/D converters. You have comparators.

I'm sorry. I looked -- looked away from you.

You have comparators. You have digital receivers in the form of a SPI or an I2C, SMBus. So you have this capture side.

You have the compute element, then, that takes that information that's captured and then you analyze it. You -- maybe you put -- you do some -- maybe you do some digital signal processing. One of our products we had, we built an onboard DSP so that you didn't -- so the DSP could be off- -- you could offload some digital signal processing onto that so that the microcontroller, which is -- a microcontroller architecture is very much designed

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2 to support interrupts and -- from pins and things in the
3 outside world. And if you're doing -- if you're doing
4 some processing, you may want to offload that so it's not
5 interrupted by any -- from interrupted service routines.

6 Q. So, for the record, "DSP" stands for?

7 A. It stands for digital signal processor.

8 So -- so we -- so then we -- we did the -- the
9 computing of the information for whatever application.
10 Maybe it's open and close meter, maybe it's pulse
11 oximeter, you know, a myriad and varied application,
12 broadly.

13 One of our chips was on the spaceship that run --
14 on XPRIZE. It was the fuel controller on the -- on the --
15 on the -- that ship that went up -- met the 60-mile
16 height. So we were -- our chip was used as a fuel
17 controller.

18 And then on the communicate side, then we would
19 have the -- again, we might use the -- some of the same
20 things we did on the capture side, but we have the SPI,
21 the SMBus. And this is where my vision was to add the
22 wireless component which we weren't able to do because we
23 were still a small company, and we just didn't have the
24 resources to -- to build up that element.

25 So then -- but the communicate side was in the --

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2 whatever results you had, somebody else was going to want
3 to see them, so you had to be able to communicate them.

4 Q. But you didn't do any design with the communicate
5 part?

6 A. Didn't -- well, strictly speaking, do you mean --
7 yeah. I mean, we -- we did SPI, SMBus, USB. We did those
8 part of the communicate elements as well. So we did do
9 those designs.

10 Q. But it wasn't part of creating RF circuitry-type
11 designs?

12 A. There was no RF circuitry in the product line up
13 through 2003.

14 Q. Okay. I understand you said earlier you were
15 acquired by Silicon Labs?

16 A. Yes.

17 Q. So did you have a financial interest in your
18 company that when they acquired you, you profited from
19 that purchase?

20 A. Yes, I did.

21 Q. That's appropriate.

22 So did you get stock options with -- as well when
23 you -- it was purchased --

24 A. Yes.

25 Q. -- in Silicon Labs?

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A. Yes.

Q. Do you have a financial interest in Silicon Labs still?

A. No, I do not.

Q. Moving on just a little bit. You have not served as an expert witness before the U.S. -- United States Patent and Trademark Office? Not just in IPR, but for, for instance, getting a patent filing declaration?

A. I -- I did -- no, I did file a declaration once for -- for a client. It was a one-off kind of event.

Q. So you were testifying as far as being an expert in a technical area having to do with a patent application?

A. Yes.

Q. Have you ever served as an expert witness before the International Trade Commission?

A. No, I was not.

Q. Have you served as an expert witness in litigation, like in a district court proceeding?

A. No. No.

Q. Or before any kind of a --

A. Yeah. The -- the prior case that I referred to, I never went into court. I did a deposition. I don't know if that qualifies in the terms you're describing, but

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I just simply gave a deposition. I didn't go to --

Q. So you didn't have to go and --

A. Sit in front of a judge.

Q. -- a judge or --

A. No.

Q. But you did file a deposition?

A. I did file a deposition, yes.

Q. How many hours have you spent preparing for this declaration that you filed?

A. Oh, I don't know. Probably three or four days in total.

Q. How many hours have you spent total on this case?

A. Probably north of 200 since I was originally engaged by Silicon Labs. Yeah.

Q. So were you paid for doing this work?

A. Yes, I am.

Q. How much have you been paid so far?

A. My rate -- I don't know the total amount paid, but my rate's \$275 an hour up until the beginning of this portion. That's probably something that should be noted. For the pre-dep and dep, my rate's \$400 an hour. So -- but up to now, it's 200-plus hours times 275, whatever that works out to. That's -- although they still owe me a check, so I haven't been paid yet.

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Q. Did anyone draft the declaration for you?

A. I drafted the original work myself.

Q. Was it edited by anyone?

A. Yes. I worked with the -- with Lee & Hayes guys in the process of iterating that declaration, yes.

Q. So you authored the declaration?

A. Yes.

Q. Let's move on.

Oh, before I move on, I want to go to Exhibit 2045.

I've handed you Exhibit 2045. Do you recognize it?

A. I do.

Q. Can you tell me what it is?

A. It's my LinkedIn page.

Q. Nice picture.

A. Thank you.

Q. Is the LinkedIn in any way different than your CV?

A. I don't know. I don't think so. I've never laid them together and tried to do a correlation.

Q. Is this -- I should have asked you on Exhibit 2044. That's accurate. Correct?

A. It's mostly accurate. Best of my knowledge, it's

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accurate.

Q. And the LinkedIn, 2045, it's accurate?

A. I believe it is. To the best of my knowledge. There could very well be some errors in it.

Q. Turning to your skills. Did you -- you did not list RF circuit design?

A. I did not list RF circuit design.

Q. How would you define the term "heterodyne reception"?

MR. AYERS: Objection; form.

A. Well, I wasn't asked -- in my declaration, I don't think I was asked to define it. Was there some place that I said that that y'all are asking me about?

Q. (BY MR. FLEMING) It's kind of fundamental to RF circuit design.

A. Yeah. I think Edwin Armstrong invented it in 1918, actually while he was in France. The concept is where you take a signal and you mix it down to a lower frequency where it's easier to process. And then you take that signal and then you demodulate it and use whatever it is, information you're trying to extract from it. That's the simplest understanding.

Q. Turning back to your LinkedIn, Exhibit 2045. Why didn't you list RF circuit design as a skill set?

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A. I don't know.

Q. Going on to definition of terms. Are you familiar with the term "superheterodyne"?

A. Yes.

Q. What does that mean?

MR. AYERS: Objection; form.

A. Well, I -- it's -- actually, you know, I don't know the specific definition of superheterodyne.

Q. (BY MR. FLEMING) How would you design the term "television receiver"?

MR. AYERS: Objection; form.

A. I would define it as a receiver that receives television signals.

Q. (BY MR. FLEMING) And what is its function?

MR. AYERS: Objection; form.

A. I would say its function is to receive television signals.

Q. (BY MR. FLEMING) Exhibit 2007.

I've handed you Exhibit 2007. Can you tell me what the title is?

A. The title is "IEEE 100 The Authoritative Dictionary of IEEE Standard Terms, Seventh Edition."

Q. I did not provide you the entire copy. I just got certain pages that are of interest in this case.

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A. Okay.

Q. If you turn to Page 1158 --

MR. AYERS: Are they supposed to be consecutively numbered?

MR. FLEMING: You don't have 1158?

Q. (BY MR. FLEMING) If you turn to 1159.

A. So not 1158, as you earlier requested?

Q. I'm sorry. It's 1159. Could you read the definition of television receiver?

A. Okay.

[READING]: A radio receiver for converting incoming electrical signals and into television pictures and customarily associated sound.

Q. So would you change your definition now after reading the definition?

MR. AYERS: Objection; form.

A. I'm -- this is -- I'm happy with this definition.

Q. (BY MR. FLEMING) So then the function of a television receiver is to do what?

MR. AYERS: Objection; form.

A. [READING]: Television receiver - a radio receiver for converting incoming electric signals into television pictures and customarily associated sounds.

That would be its function.

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Q. (BY MR. FLEMING) What would you say is the definition of "television tuner"?

MR. AYERS: Objection; form.

A. Is there a definition here?

Q. (BY MR. FLEMING) I'm asking you before we turn to the definition.

A. Well, I -- I suspect that it would be an ordinary understanding. When I change the channel on my TV, that's the tuner, I'm tuning a channel.

Q. Can you turn to -- I hope it's the right page -- 1220.

A. I'm there.

Q. What is the definition of "tuner (1)"?

A. [READING]: Tuner (1) (radio receivers) - In the broad sense, a device for tuning. Specifically, in radio receiver practice, it is (A) a packaged unit capable of producing only the first portion of the functions of a receiver and delivering either radio-frequency, intermediate-frequency, or demodulated information to some other equipment, or (B) that portion of that receiver that contains the circuits that are tuned to resonance at the received-signal frequency.

Q. How would you define -- and would you agree with that definition?

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A. Yeah. After all, it's IEEE.

Q. How -- how would you define "baseband"?

MR. AYERS: Objection; form.

A. Is that in this definition?

Q. (BY MR. FLEMING) No.

A. Oh, okay. So you're --

Q. I'm asking you what your definition is.

MR. AYERS: Objection; form.

A. Well, I didn't -- again, I didn't -- I didn't provide a definition in my declaration. But my understanding, it's a -- it's a signal without transmission frequency.

Q. (BY MR. FLEMING) So if we could turn to Page 86, which I'm not sure if I have 86. Yeah, 87, "baseband signaling," would you read that definition.

A. [READING]: The transmission of a signal at its original frequency, that is, not changed by modulation. It can -- it can be an analog or a digital signal.

Q. So with that definition, is that the same or different than your definition?

MR. AYERS: Objection; form.

A. Let me read that a second.

MR. AYERS: I'm having a hard time finding that. Which page are you on?

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MR. FLEMING: 87.

(Discussion off the written record.)

(Witness reviews document.)

A. Yeah, I think that's consistent, yeah.

Q. (BY MR. FLEMING) Can you watch a video baseband signal? Could you just send it to a TV receiv- -- I mean, to a display?

MR. AYERS: Objection; form.

A. Our communication right now is baseband. So I've never thought of the picture as baseband. Is that's what you're asking?

Q. (BY MR. FLEMING) A baseband video signal, would that be something that didn't require any further processing, just could be -- that will be the video signal?

MR. AYERS: Objection; form.

A. Yeah, I think that in the literature you quite often see sloppy application of the term "baseband." If I interpret it strictly based upon this definition, then the picture would be baseband.

Q. (BY MR. FLEMING) So to reiterate again and ask again, do you have any -- what experience do you have with the area of television receivers?

A. Well, when I was in the 10th grade, I took a

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2 class on basic electronics, and in that class that was my
3 real first introduction to electronics and I learned, you
4 know, the basics, how to solder, Ohm's law, Kirchhoff's
5 law, those kind of things.

6 But the key component of that was to -- to build
7 various projects. My first big project was the All
8 American Five tube radio. So I built that. In fact, I
9 still have it and it still works.

10 I was so engaged in electronics that I decided
11 to --

12 Q. What year was that?

13 A. It would have been 1970, more or less. Because I
14 graduated in '73. Yeah. I think '70 is accurate.

15 So I decided -- the high school I was at offered
16 vocational training, which really it's for people that,
17 you know, need to learn some skill. But I was so in love
18 with electronics that I took the vocational class for two
19 years. And that class consisted of radio and TV repair.
20 And so I repaired lots and lots of radios.

21 As a matter of fact, one year I was the number
22 one student that repaired more radios than -- and TVs than
23 anybody else. So I was at the top of my class.

24 So I -- you know, I was very familiar with
25 televisions. I never -- I didn't design one, but I was

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certainly --

Q. Have you worked on one recently?

A. No, they're a little bit more complicated now, you know.

Q. Were you familiar with Heathkits back then?

A. I built -- I built several Heathkits. Absolutely, yeah.

Q. Me too.

A. Those were -- those were pretty cool. I miss those times.

Q. But those kind of circuits are quite a bit different than what we have today for TV receivers?

A. They were -- they were strictly analog, but they used the -- the -- these things that you referred to earlier, superheterodyne receivers, they had mixers, they had modulation. They had all -- I mean, all the -- all the fundamental things.

Q. But they didn't use tech- -- digital technology and --

A. They did not -- they did not use digital signal processors.

Q. What is your experience you have in the area of RF receivers more generally?

A. Well, the -- one of the other things I did was in

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college, one of the classes I took was basically radio frequency circuits, and we learned to design stuff. And one of the things I designed was a -- what -- what the project was, to be able to receive Citizens Band radio. This is circa '76. '77.

And so what -- what I built was a 9 -- 9 megahertz oscillator. The whole concept then was to receive the Citizens Band radio waves, mix those down to the broadcast range of an AM radio, which is 550 to 16 something, and then you would then be able to receive the CB channels on the radio. And so I built -- it was hard to build a 27 megahertz oscillator with kind of discrete bipolar transistors, so what I did was I built a 9 megahertz oscillator and operated it in a nonlinear mode, so that I got the third harmonic, which gave me my 27 megahertz. And I took -- I coupled that third harmonic then to my mixer where I -- where I brought in from the antenna. And then that mixed down result was what -- I set the thing next to the AM radio and received -- received Citizens Band radio and an A in the class.

Q. And what -- and what -- what year was this?

A. I'm thinking it was '76, '77.

Q. Uh-huh.

A. It was one of the last -- last two semesters. It

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might have been spring of '77.

Q. So, again, it's all analog?

A. Yeah, it was all analog.

Q. No digital RF design?

A. No.

Q. What is your experience with RF integrated circuits?

A. Well, right now I'm designing for another client a -- a system that uses the new Bluetooth low energy protocol. And so I'm designing the microcontroller interconnecting with a MIMs sensor, nonaccess sensor, talking to the Bluetooth device and the Bluetooth protocols. And then I'm -- so I'm doing the design which is complete and all of the software for -- for managing the interface between the MIMs device and the Bluetooth device.

Q. Uh-huh.

MR. AYERS: I just want to caution you.

I don't mean to have a speaking objection.

But I don't know whether that is a confidential engagement, so I just want to caution you against disclosing any confidential information in connection with your retention.

Q. (BY MR. FLEMING) This is going to be in a public

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record.

A. Yeah, there's -- up to that point there's nothing confidential exposed.

THE WITNESS: But thank you.

Q. (BY MR. FLEMING) But that design is not having to do with the actual RF receiver part?

A. I'm not designing the circuitry in the rec- -- in the receiver.

Q. Let's turn to your declaration. I believe that's Exhibit 1009.

MR. FLEMING: We're going have to have two. One is 1009 for 728, and then the other one is 109 for 809.

(Discussion off the written record.)

MR. AYERS: Just a suggestion, when this was submitted, the IPR numbers weren't assigned. It might be easier to refer to them by patent number, since there is no -- there's nothing on them that indicate they're from the specific IPRs.

MR. FLEMING: But they're Exhibit 1009.

MR. AYERS: I know they're both 1009.

MR. FLEMING: Okay. So I'm going to refer to them as the IPR number 1009, 728, and --

MR. AYERS: There is nothing on here that

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includes that number, is my point.

MR. FLEMING: Can you put the 728 on the one --

MR. AYERS: I can. But are you -- are you saying you're going to mark these as exhibits in the deposition, or are you just --

MR. FLEMING: She's going to reference them as 728 and 809, and then that will correspond to our exhibits in the --

MR. AYERS: Okay.

MR. FLEMING: I just want to use the IPR number, so I just don't get confused.

(Discussion off the written record.)

Q. (BY MR. FLEMING) Okay. On Page 1 -- I've handed you Exhibit 1009 from IPR 2014-00728. Do you recognize this?

A. Yes, I do.

Q. Is this your declaration?

A. This is my declaration, yes.

Q. And then I also handed you Exhibit 1009 from IPR 2014-00809. Do you recognize what this is?

A. Yes, it is.

Q. And what is the document?

A. It's my declaration.

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Q. Okay. On Page 1 of each declaration, you state that you're the named inventor on 39 patents?

A. Yes.

Q. Do any of these 39 U.S. patents mention television?

A. I don't think so.

Q. Do any of these 39 patents mention television receivers?

A. I don't -- I'm not certain if they do or not.

Actually, back to the first question, I -- I can't say for certain that they don't have the word "television" in them. Some of my patents were on imaging products which would have been -- we -- we provided YCrCb in various components that go into television receivers. I may have mentioned it in the introduction.

So to correct my previous, I'm not certain that "television" does not in those patents.

Q. Do you have a patent number in mind? Because I do have all your --

A. Yeah. Let's look.

So let's look at 6,720,999.

Also 686,957.

Also, it might well be in 6,617,934.

Q. Let's ask it another way. Do you think that

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there -- the term "television receiver" is in 4,849,662?

A. No, I don't believe it's in there.

Q. Do you believe that "television receiver" is in 172,361?

A. I don't recognize that number.

Q. Okay. Do you --

A. Oh. It's 6,172,361.

Q. 6,172,361.

A. Yeah. I only heard the last four digits.

MR. AYERS: Objection; form.

A. I don't know for that one. That's an imager patent.

Q. (BY MR. FLEMING) How about U.S. Patent No. 6,617,934?

A. I can't say for certain there. That was also an imaging product group.

Q. How about for Patent No. -- U.S. Patent No. 7,171,542?

A. No. I doubt "TV" is in there.

Q. How about 7,286,176?

A. Possibly. Again, that's an imager group.

Q. Okay. That's Exhibit No. 2027.

So I've provided you Exhibit 2027. Do you recognize this document?

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THE WITNESS: I got an extra copy here.
Somebody need one?

A. Vaguely. I haven't looked at these in a long time.

Q. (BY MR. FLEMING) Is this where you were a named inventor?

A. Yes.

Q. And is it U.S. Patent No. 7,286,176?

A. It is.

Q. Does it mention television receivers?

A. Give me some time.

(Witness reviews document.)

MR. FLEMING: May I suggest that we take a break, and during the break, you can look at it?

MR. AYERS: No, he's not going to look at this over the break. If you want him to look through this, he's going to look at it on the record.

MR. FLEMING: Okay.

(Witness reviews document.)

A. I doubt -- I can't testify if the word "television" -- that's somewhat unfair to expect me to know whether the word "television" is in here without reading it fully. But I'll respect your time and interest and offer that I doubt that "television" is in here in any

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substantive way. Does that satisfy your question?

Q. (BY MR. FLEMING) Yes, it does. Thank you so much.

Just to finish the list, would you think that there would be either television receivers or radio frequency signal processing in U.S. Patent No. 7,289,145?

A. Again, that's in the same group. And the word "television" may well be in there, but it's probably not in there in any substantive way. Is that satisfactory?

Q. Yes.

How about U.S. Patent Application 2002/0176009?

A. I don't have that in front of me.

MR. AYERS: Is that a patent application number or a patent number?

THE WITNESS: It sounds like a patent application. Would you produce that document and allow me review it?

Q. (BY MR. FLEMING) Sure. It is Exhibit 2029.

(Witness reviews document.)

A. Yeah. Again, I doubt that -- well, the word "television" may well be in here. I doubt that it's used in any substantive way.

Q. (BY MR. FLEMING) How about application No. 2006/0212679? That's a U.S. Patent Application.

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Do you want the exhibit?

A. (Nods.)

Q. That would be Exhibit 2030.

(Witness reviews document.)

A. No "television" is not in that one.

Q. (BY MR. FLEMING) Are you aware that the eight patents that I read off were filed in the IPR? In, looks like -- in, actually, all three IPRs.

MR. AYERS: Objection; form.

A. I remember -- all I know is that I heard some mention that there was some additional information about my -- my résumé was submitted. I don't know -- those -- those specific patents, no, I didn't know that.

Q. (BY MR. FLEMING) Let's move on a little bit.

In the design of television RF receivers versus cellular telephones, is there different design criteria?

MR. AYERS: Objection; form.

A. I didn't address that in my declaration.

Design criteria from what perspective? Like, does it have to operate from different voltages?

"Design criteria" is an incredibly broad term. There are different circuits, different applications. I can say that.

Q. (BY MR. FLEMING) Can you tell me how they might

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be different?

MR. AYERS: Objection; form.

A. Cell phone is for communicating on a cellular network. A TV is for communicating both broadcast, satellite and cable network.

Q. (BY MR. FLEMING) Is there different radio frequency performance?

MR. AYERS: Objection; form.

A. There are different -- there are different frequencies.

Q. (BY MR. FLEMING) What is "wideband communication"?

MR. AYERS: Objection; form.

A. I don't know. I would say it's -- I haven't formulated an opinion on the definition of "wideband." I have a sense of what it is, but --

Q. (BY MR. FLEMING) What about the term "broadband communication"?

MR. AYERS: Objection; form.

A. I don't have a definition for "broadband."

Q. (BY MR. FLEMING) What about "narrowband communication"?

A. It would be narrower than wideband communication.

Q. Would you view a television signal as a

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narrowband?

MR. AYERS: Objection; form.

A. I really haven't thought of it. It's probably well -- well documented, but, you know, it's not on the top of my head.

Q. (BY MR. FLEMING) So a similar question. Would you consider television signals wideband or broadband communications?

MR. AYERS: Objection; form.

A. Again, I haven't considered those.

Q. (BY MR. FLEMING) What would you consider the emphasis of Patent No. 707,585 -- 585, which is the patent being challenged by IPR 2014-00728? Is it directed to television RF signal receivers?

MR. AYERS: Objection; form.

A. It's entitled "Broadband Receiver Having a Multichannel Receiver Filter." It is directed toward television receivers.

Q. (BY MR. FLEMING) So it is directed to broadband, not narrowband?

A. That's what -- that's correct. That's what the title says, yes.

Q. What would you consider the main component of a television receiver?

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2 MR. AYERS: Objection; form.

3 A. I never considered --

4 MR. AYERS: If you'll just give me a second
5 to object before you answer --

6 THE WITNESS: Oh, I'm sorry.

7 MR. AYERS: I apologize.

8 Objection; form.

9 A. I've never considered a main component.

10 Q. (BY MR. FLEMING) Would you consider that the two
11 main components as a tuner and a channel filter and
12 demodulators?

13 MR. AYERS: Objection; form.

14 You may answer.

15 A. Those are three components. Those aren't two
16 components.

17 Q. (BY MR. FLEMING) Good point. Well, then the
18 three main components, if you want it put it that way?

19 A. I haven't -- I haven't considered what would be
20 the main components.

21 Q. What would you consider the main characteristics
22 of a television RF signal?

23 MR. AYERS: Objection; form.

24 A. I haven't tried to classify main characteristics
25 of the television signal.

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Q. (BY MR. FLEMING) Would you say it would be fair to say that one of the characteristics is that it has to carry both a video signal and an audio signal?

A. I would accept that.

Q. And that would be different than what we know of a cellular telephone as just carrying an audio signal?

MR. AYERS: Objection; form.

A. Actually, that's not correct.

Q. (BY MR. FLEMING) Cellular phone carry video signals now?

A. Yes, they do.

Q. What range of television RF signal band frequencies? What are the range?

MR. AYERS: Objection; form.

A. We covered that.

(Witness reviews document.)

Q. (BY MR. FLEMING) Dr. Holberg, you don't have that on the top of your head?

A. I don't have that on the top of my head, no.

Q. Maybe to jog your memory, would you agree that the range possibly could be between 54 megahertz to 870 -- I'm sorry -- 890 megahertz?

A. Those numbers sound -- from what I -- I remember, yes.

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Q. Backing up to your observations that cell phones carry video. Did they carry video in 2001?

MR. AYERS: Objection; form.

A. I'm not certain. There was a transition period in there somewhere.

Q. (BY MR. FLEMING) How about 2004, does -- did cell phones carry video then?

A. Yes.

MR. AYERS: We've been going for about an hour.

MR. FLEMING: Let's take a break.

(Break.)

Q. (BY MR. FLEMING) To just recap so that we know where we're at. I was asking you the question of the range of television RF signal band frequencies. And I had suggested that 500 and -- I'm sorry -- 54 megahertz to 870 megahertz for an antenna is the range, and you had responded that --

A. That sounds about right, yeah.

Q. And then so my question is, what is that ratio? Is it not a 20:1 ratio, the signal frequency for television, from the lowest to the highest in that range?

A. What were the numbers again?

Q. 54 to 890.

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(Discussion off the written record.)

A. It looks like 16 and change.

Q. (BY MR. FLEMING) Yeah. So it's a -- it's a big ratio, 16:1?

MR. AYERS: Objection; form.

A. Why did you say 20, then?

Q. (BY MR. FLEMING) Because the range can be even higher than that.

A. Okay.

Q. So lowest to highest is, as you're calculating, around 16?

A. And some change.

Q. Yeah. And change.

So that's a pretty big ratio, so that's why it -- this broadband frequency is a big range of frequencies --

MR. AYERS: Objection; form.

A. Well, yeah, I didn't define "broadband," so I don't know if 16 is the right number or 160.

Q. (BY MR. FLEMING) Okay. Would you say that because of that range and also because it's carrying video as well as audio, it's more challenging to design a television receiver than a cellular phone --

MR. AYERS: Objection --

Q. (BY MR. FLEMING) -- if it's not carrying video?

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MR. AYERS: Objection; form.

A. I've never considered the difference in challenge.

Q. (BY MR. FLEMING) Would interference be a problem across such a broad range -- broadband range of frequencies?

MR. AYERS: Objection; form.

A. In my analysis for this work, I didn't analyze the various interferers apart from aliasing type interferers.

Q. (BY MR. FLEMING) Have you ever heard of the term "sensitivity"?

A. Yes, I have.

Q. What does that mean?

MR. AYERS: Objection; form.

A. In the context of electronics and receivers, it would be the level at which you can -- a measure of what you're able to -- the level of what you're able to sense.

Q. (BY MR. FLEMING) Does signal --

A. My ears have a certain sensitivity.

Q. Uh-huh.

A. At some point if you can lower your voice, I won't be able to hear you.

Q. And the reason is why?

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A. Because the signals don't active- -- your -- the airwaves that's coming from you would not activate my cochlear ear things.

Q. What about the -- are you familiar with the term "signal-to-noise ratio"?

A. Yes, I am.

Q. Would sensitivity have something to do with that ratio?

A. Yes.

Q. Can you explain?

A. I could, but I'm not prepared to give a lecture on signal-to-noise ratio.

Q. Have you heard of the term -- in the terms of RF television signal receiver art, have you heard of the term "selectivity"?

A. Yes.

Q. Can you tell me what that means?

A. In -- by analogy, if we were all talking in this room and I was able to capture your voice in a conversation, that would be selectivity, in a sense. I'm selectively capturing your voice amongst all the other voices. Though how well I was able to do that would be a measure of my selectivity.

Q. In terms of electronics, not in terms of human

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ears, how do the -- what is the conventional way in which you ensure selectivity?

A. Well --

Q. And --

A. I'm not sure about the con- -- "conventional" adjective. But to transition from the conversation in a crowded room metaphor to electronics in the airwaves, there are lots of signals, and you may wish to select a particular signal of interest. And the ability to do that would be a -- I think would be a measure of selectivity.

Q. So would you agree you would do that by blocking the other signals?

MR. AYERS: Objection; form.

Q. (BY MR. FLEMING) Or blocking other channels maybe would be a better way of saying it.

A. Well, continuing with my metaphor, which works quite well, all those sounds are still coming in my ears, just as all those waves are coming into your receiver. The blocking aspect I'm not sure how to construe it. If you could be more specific, maybe I could...

Q. I think we're good.

A. Okay.

Q. If we go to the television RF signal television receiver art and I mentioned the term "signal-to-noise

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ratio," does that have a special meaning in that art?

MR. AYERS: Objection; form.

A. I don't think so. But I'm not sure.

Q. (BY MR. FLEMING) I want to introduce again Exhibit 2007. And, again, this is "The IEEE 100 - The Authoritative Dictionary of IEEE Standard Terms, Seventh Edition."

Okay. And I want to turn to Page 1051.

A. Okay.

Q. Definition 3, "television definition transmission," could you read that definition?

A. Oh. This is under the topic of signal to noise.

Q. Uh-huh. There's three definitions.

A. Okay. I got it.

MR. AYERS: Objection; form.

There is actually 13 definitions.

A. Okay. I'll read what 3 says. It says:

Television transmission - the signal-to-noise ratio at any point is the ratio in decibels of the maximum peak-to-peak voltage of the video television signal, including synchronizing pulse to the root-means-square voltage of the noise. Note - The signal-to-noise ratio is defined in this way because of the difficulty of defining the root-means-square value of the video signal or the

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peak-to-peak value of random noise.

Q. (BY MR. FLEMING) Were you familiar with this definition?

A. Actually, no.

Q. In the RF signal receiver art, what is meant by "RF front-end linearity"?

MR. AYERS: Object to the form.

Q. (BY MR. FLEMING) L-I-N-E-A-R-I-T-Y.

A. Where do you see that?

Q. I don't have it here yet.

A. Okay.

Q. Linearity.

A. I thought you were referring to something I just read.

So now that I know -- ask me again.

Q. Okay. In the RF signal receiver art, what is meant by the term "RF front-end linearity"?

MR. AYERS: Objection; form.

A. I've never heard the term "linearity."

Q. (BY MR. FLEMING) Okay. I want to introduce Exhibit 2004.

Are you familiar with this publication?

A. EDN is the publication you're referring?

Q. Yes.

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A. Yes, I'm familiar with EDN.

Q. And have you seen this article?

A. No. I don't --

Q. And can you read the title of the article?

A. "Silicon TV Tuners: The Game Is On."

Q. And if we turn to Page 4 of 5 --

MR. AYERS: For the record, we object to the introduction of this exhibit.

Q. (BY MR. FLEMING) If we turn to the last sentence of the -- of Page -- I have labeled as 4. And it starts "according to." It's in the left column right on top of that figure.

A. Yeah, I see that. I see your -- you must have misspelled the word in your note. It's linearity.

Q. I just can't say it. Sorry.

A. Okay.

[READING]: According to Eric Garlepp, senior project manager at Silicon Labs, linearity in a TV-tuner chip involves two aspects: inherent broadband linearity to cope with large signals across the bandwidth and linearity after filtering out the 6-megahertz band, which is important for accurate signal reproduction and picture quality.

Is that far enough?

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Q. Uh-huh. Have you heard of this term?

A. Linearity, is very com- --

MR. AYERS: Objection; form.

A. Yes, I've heard of the term "linearity."

Q. (BY MR. FLEMING) And what does that mean?

MR. AYERS: Objection; form.

A. Something is linear if it can be described as a -- in terms of $y = mx + b$. If there are no high order terms of X or high order terms of Y, then it's linear.

Q. (BY MR. FLEMING) And do you agree that this is important to RF television signal --

MR. AYERS: Objection; form.

Q. (BY MR. FLEMING) -- receivers?

A. Yeah, I haven't considered that.

Q. Did you notice who Eric Garlepp is?

A. Did I notice?

Q. Uh-huh.

A. Are you asking me do I know who Eric Garlepp --

Q. No. Did you know him?

A. I have met Eric, yes.

Q. Oh, you have?

A. Yes.

Q. And who is he?

A. He's a -- he's at Silicon Labs. I thought he was

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a marketing guy. I didn't know he was product manager.

Q. I'd like to also introduce Exhibit 2005.

MR. AYERS: Objection.

Q. (BY MR. FLEMING) This is downloaded from the Silicon Labs' website, and it has a -- it is a PDF that has a date.

MR. AYERS: Objection; form.

Is that a question or --

MR. FLEMING: I'm just telling him where I got it from.

Q. (BY MR. FLEMING) Can you read the title of the document?

A. "Developing Economical, Mainstream Television Designs with Next-Generation Silicon TV Tuner ICs."

Q. And I notice it has a logo on it. Is that the Silicon Labs' logo?

A. Yes, it is.

Q. Turn to Page 4. The first full paragraph, could you read it.

A. Is that starting with "channel reception"?

Q. Yes, it is.

MR. AYERS: Objection; form.

A. [READING]: Channel reception: The keys to achieving clear TV broadcast reception are sensitivity and

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selectivity. These characteristics in turn are based on low noise figure (NF), high RF front-end linearity and high-quality RF front-end filtering. Low noise figure means that the RF front-end adds very little unwanted noise to the incoming signal, while high sensitivity means that there is ample video signal-to-noise ratio (VSNR) even with weak input signals to correctly receive the broadcast. But TV tuners almost always need to receive a single broadcast in the presence of many other signals. This is where the silicon tuner IC's selectivity - the ability to block or exclude content on nearby "blocker" channels - is essential for clean reception. To achieve high selectivity in a cost-effective solution, a silicon tuner IC needs both high linearity and high quality filtering in the RF front-end.

Q. (BY MR. FLEMING) That's fine.

Do you agree with this statement?

MR. AYERS: Objection; form.

A. I would have to spend some time analyzing it before I just agree with it out of --

Q. (BY MR. FLEMING) You didn't consider these sort of criteria when you were doing the deposition (sic)?

MR. AYERS: Objection; form.

A. I read the claims of the patents on the prior

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art. That's what I did in this exercise.

Q. (BY MR. FLEMING) But you didn't consider these criteria?

MR. AYERS: Objection; form.

A. No. I read the claims on the art.

Q. (BY MR. FLEMING) Why is it necessary to filter a received television signal before performing necessary frequency modulation?

MR. AYERS: Objection; form.

A. You're asking me to analyze the signal chains, the line of questioning, and in my work, I didn't do that analysis.

Q. (BY MR. FLEMING) What does the acronym "SAW," S-A-W, all caps, stand for?

A. It stands for surface acoustic wave.

Q. What is a characteristic of a surface acoustic wave?

MR. AYERS: Objection; form.

A. I've never considered the characteristics of the wave itself.

Q. (BY MR. FLEMING) Is that a particular device, a SAW filter?

MR. AYERS: Objection; form.

A. The principal of surface acoustic waves are used

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to construct devices, yes.

Q. (BY MR. FLEMING) Filters?

A. Filters.

Q. And how do these filters work?

MR. AYERS: Objection; form.

A. I've never studied in any detail SAW devices.

Q. (BY MR. FLEMING) Would you consider them a digital device?

A. No, I would not.

Q. Can you integrate easily a SAW filter?

MR. AYERS: Objection; form.

A. You cannot integrate them easily.

Ask for clarification, when you say "integrate" --

Q. Onto a single chip.

A. Monolithic form?

Q. Yes.

A. Correct.

Q. And the term "ATSC," what does that stand for?

A. American Television Standards Committee.

Q. That's a standard?

A. They produced a standard --

Q. Yes.

A. -- but they are a committee.

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Q. Okay. In that standard, what type of modulation do we have?

A. I think it's 8VSB.

Q. And what does that stand for?

A. I know, but it's not part -- vestigial -- 8 level vestigial sideband.

Q. In analog TVs transmitted by satellite, what type of modulation do we have?

MR. AYERS: Objection; form.

A. There may be multiple types. Certainly in the Thomson reference it was QPSK.

Q. (BY MR. FLEMING) What is the required signal-to-noise ratio required for a good analog TV tuner?

MR. AYERS: Objection; form.

A. I don't know.

Q. (BY MR. FLEMING) What is the definition of "dBm"?

MR. AYERS: Objection; form.

A. What? The definition of what?

Q. (BY MR. FLEMING) What's it stand for?

A. Say it again, please.

Q. Sorry. It's dBm.

A. dBm?

Q. Yes.

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A. That's -- decimals is a logarithmic ratio, and dBm is a ratio -- is a power -- it's a power ratio, and dBm relates to a particular impedance. I think 50 ohms, as I recall.

Q. Are you familiar --

A. Db with respect to 50 ohm. 1 milliwatt power level is the reference level for dB. Normally dBs is just a ratio. It can be dB of, you know, stock market, you know, but it's not typically used like that. But dBm, you reference it back to 1 milliwatt.

Q. You mentioned Cadence. You're familiar with Cadence?

A. Yes.

Q. And that's a company?

A. Yes.

Q. And why is that useful? The company product is what?

A. Software.

Q. And generally used for what?

A. Integrated circuit design.

Q. In RF theory, what is the number, the noise number, which is simulated by Cadence software for a mixer? Is it single sideband or double sideband?

MR. AYERS: Objection; form.

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A. In their circuit simulation software? Is what you're asking?

Q. (BY MR. FLEMING) (Nods.)

A. Cadence is a broad layout software, extraction software, simulation software, SPICE, harmonic analysis.

Q. When --

A. So I suspect -- I have not -- I don't know the answer.

Q. Okay. Turning to --

(Telephone interruption.)

Q. (BY MR. FLEMING) Going back to Exhibit 1009 for IPR 2014-00809; and also Exhibit 1009, IPR 2014-00728.

In Sections IV(B), IV(D) and V in Declaration 728 and Sections IV(C) and (D) in Declaration 809, you set out various opinions on various legal principles.

MR. AYERS: Objection; form.

A. I have this document in front of me, but I can't find these places you're referencing.

Q. (BY MR. FLEMING) Okay.

A. But this is -- this document represents my legal opinion.

Q. Okay. Are you a legal expert?

A. I'm sorry. Let me correct that. It's not a legal opinion. It's my technical opinion.

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No, I'm not a legal expert.

Q. So the legal principles recited in the sections of your declaration are things you simply assumed were true and which you have no opinion?

A. Take me to a specific place.

Q. Let's go to 809, just as an example.

A. If you could, just give me page number and paragraph, that would be great.

Q. Yeah. When you talk about a person of ordinary skill, for instance, on Pages 6, 7 and 9, that's a legal construct. Also on Pages 8 and 9, you talk about claim construction. "Broadest reasonable in light of spec." Those are legal concepts.

A. I was just told to abide by those concepts. I didn't -- I wasn't given the task of extracting them and applying -- applying them without first being counseled.

Q. So then you assumed they were true?

A. I assumed they were true.

Q. Okay. Let's turn to Paragraph 20 of your 728 declaration.

A. Are we in the same 809 document?

Q. No, we're in this one.

On the top of Page 13?

A. I'm there.

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2 Q. You conclude that a person of skill in the art
3 would have a Master's of Science or higher degree in
4 electrical engineering, having at least four years of
5 experience with mixed-signal system design, including
6 analog front-ends and subsequent digital signal processing
7 of various analog and digital signal formats of video and
8 audio content.

9 A. That's what I said. Correct.

10 Q. Also on Paragraph 11 of your 809, I believe it's
11 the exact same language. Is that not true?

12 A. It probably is. Let me just make sure.

13 Q. That's --

14 A. We did have the problem with the spelling of
15 linearility (pronouncing).

16 Paragraph 11, you say?

17 Q. Uh-huh.

18 (Witness reviews document.)

19 A. Yes.

20 Q. (BY MR. FLEMING) Okay. Do you assume that a
21 person of ordinary skill in the art is presumed to think
22 along the lines of conventional wisdom?

23 MR. AYERS: Objection; form.

24 A. I haven't really considered that. "Conventional
25 wisdom" is not a term that I --

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Q. (BY MR. FLEMING) So what is your view of a person of ordinary skill in the art?

MR. AYERS: Objection; form.

A. As I stated here, it would be someone that had a Master's degree --

Q. (BY MR. FLEMING) That's the qualification --

MR. AYERS: Objection. Let him finish his answer, please.

Finish your answer.

A. Okay. I was going to say it's a person with a Master's degree, you know, with four years' experience as stated. Or -- or greater. Perhaps Master's...

Q. (BY MR. FLEMING) What did you base your -- this definition on?

A. My experience as a manager and the hiring that I've done over the years as a -- as a manager. We -- I would hire people with Master's degrees predominantly for these kinds of tasks.

Q. So you -- sorry. Go ahead.

A. Yeah. Okay.

Q. What facts in particular do you consider in that definition?

A. Again, I'm considering, you know, the type of individual that I might hire to perform these tasks. And

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2 so, you know, I have to choose from a spectrum of
3 capability from a BSEE with no experience to a Ph.D. with
4 long experience, where in that spectrum is the type of
5 person that I typically hire. And as an adjunct to that,
6 the type of people that I work with in -- in my -- maybe
7 they don't work for me or I didn't hire them, but are
8 people are I'm -- I'm working with on projects and such.

9 So if you look at -- for example, I would guess
10 that at Silicon Labs that predominantly we almost never
11 hired anybody with a BSEE. It would have been a rare --
12 very rare situation.

13 Q. As an adjunct professor, wouldn't you have
14 considered -- did you consider whether or not they had
15 taken particular courses?

16 A. As an adjunct professor, I taught one course.

17 Q. But you as a manager, with your experience as an
18 adjunct professor, wouldn't you consider the courses that
19 they may have taken?

20 A. Yes. Certainly.

21 Q. Does the coursework for someone that is doing
22 mixed-signal system design, would they necessarily have
23 taken any courses in RF signal design or signal
24 processing?

25 MR. AYERS: Objection; form.

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A. It doesn't preclude that.

Q. (BY MR. FLEMING) But it doesn't require that either?

A. It doesn't require that.

Q. Were you -- and when you said that -- have at least four years' experience in mixed-signal system design, that, again, doesn't require RF signal design?

MR. AYERS: Objection; form.

A. Correct.

Q. (BY MR. FLEMING) Would you consider yourself a person of ordinary skill in the art?

A. Yes.

Q. Would you consider yourself an expert?

A. Yes.

Q. If you're an expert, then you can't be one of ordinary skill?

MR. AYERS: Objection; form.

A. Oh, you trapped me, didn't you?

I have ordinary skills as a subset of my expert ability.

Q. (BY MR. FLEMING) I think you've mentioned that Cadence, the software product Cadence, is useful in RF integrated design tool?

A. I don't think I mentioned that. But it is.

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Q. Okay. Would a person of ordinary skill in the art who specializes in RF IC design be familiar with Cadence?

A. There are other companies that provide similar CAD software. Synopsys, for example, I believe has a full suite now. So they would be familiar with Cadence or -- or Synopsys. And there -- there's also some other software providers.

But there's a reasonable likelihood that they would be familiar with Cadence, yes.

Q. So is Cadence generally used for such design?

A. That's one of the uses of Cadence, yes.

Q. So what is the color of the Cadence-provided icon that a person of ordinary skill in the art would click on to launch the Cadence tool?

MR. AYERS: Objection; form.

A. I don't remember.

Q. (BY MR. FLEMING) So it's been a while since you've used Cadence software?

A. I've used it this year.

Q. Then you would know that there isn't an icon?

MR. AYERS: Objection; form.

A. There -- they have an icon. When -- when it comes up, when you bring up the tool, it comes up with a

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banner while it's loading up also.

I've used Cadence, pardon me, to a great extent. In many of the schematics that have been extracted for this case, I did a lot of that work myself.

Q. (BY MR. FLEMING) So what are the colors of the wires of the Cadence software?

MR. AYERS: Objection; form.

A. The colors of the what?

Q. (BY MR. FLEMING) Of the wires?

A. Of the software wires?

Q. The wires in which you're hooking up to your --

A. They're -- they're red, I think.

Q. What are the colors of the pins --

MR. AYERS: Objection; form.

Q. (BY MR. FLEMING) -- in Cadence?

A. The pins. The pins are red.

Q. Turning to your 728 --

Before we go to that, you had said that you were an expert in, you felt -- are you an expert even though you haven't done RF integrated circuit design?

MR. AYERS: Objection; form.

A. It was very straightforward for me to read and understand these -- the three patents in this case. It was very straightforward for me to read the claims on the

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2 prior art. It's -- I understand the elements and the ease
3 of reading them.

4 Q. (BY MR. FLEMING) Let's turn to the '585 patent,
5 which is -- that's Exhibit 1001 in IPR 2014-00728.

6 And let's turn to your Paragraph 6 in your
7 declaration for IPR 728.

8 A. Okay. I'm there.

9 Q. Okay. What are the problems that the patent '585
10 was trying to solve?

11 MR. AYERS: Objection; form.

12 A. [READING]: The '585 patent entitled "Broadband
13 Receiver Having a Multistandard Channel Filter" claims
14 priority to a provisional application filed on
15 September 17, 2001. The '585 patent admits that
16 television receivers capable of receiving multiple
17 different television standards such as NTSC and PAL were
18 known in the art. An admitted "prior art" architecture of
19 such a multistandard receiver is shown in Figure 1 of the
20 patent. As shown above, that architecture included: a
21 tuner for receiving a radiofrequency input signal; a tuner
22 for converting the RF signal --

23 Q. (BY MR. FLEMING) Can I stop you? That's not
24 what I asked. And I don't know if we can characterize
25 that all that you said was an admission. I didn't ask for

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2 admission. What I asked for was what was the problem
3 being solved?

4 A. Oh, okay. That's in Paragraph 8.

5 [READING]: The problems with this architecture
6 were two-fold...

7 But that references back to what you didn't allow
8 me to read. But that's fine.

9 [READING]: The problems with this architecture
10 were two-fold, according to the '585 patent: "First,
11 conventional television receivers use discrete analog and
12 digital components," and "Second, the conventional
13 multi-standard television receivers require duplicate
14 components to support different television standards."

15 Q. Right. So duplicate components was one of the
16 large problems they were trying to solve?

17 MR. AYERS: Objection; form.

18 A. That was one of the problems.

19 Q. (BY MR. FLEMING) But --

20 A. But neither large or small, I don't think.

21 Q. And if you look at Figure 1, one of the duplicate
22 circuits was the channel filters, 18a, 18b and 18c?

23 A. Correct.

24 Q. So they had a dedicated channel filter for each
25 format or standard?

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2 A. That's what it says here: Comprised of a bank of
3 channel filters, each corresponding to a specific format
4 and standard.

5 Not "or standard."

6 Q. "And standard."

7 A. Yeah.

8 Q. Okay. And that's what you said in your
9 declaration?

10 A. Yeah.

11 Q. Okay.

12 A. Well, I'm quoting. I believe I'm quoting from
13 that. I have it in quotes. I'm pretty sure I can quote
14 it from the spec, so...

15 Q. Okay. So the '585 patent, then, solves this
16 problem with having one digital signal processor,
17 Circuit 130, shown in Figure 2. Correct?

18 MR. AYERS: Objection; form.

19 A. All right. Now I have the figure in front of me.
20 Restate the question.

21 Q. (BY MR. FLEMING) Replacing the duplicate channel
22 filters shown in Figure 1, 18a, 18b, 18c with a single
23 channel filter, in particular, a DSP 64?

24 MR. AYERS: Objection; form.

25 A. The '585 purports to solve the shortcomings of

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2 the prior art by processing the IF signal in the digital
3 domain. The DSP is one component in that.

4 Q. (BY MR. FLEMING) But it doesn't have duplicate
5 components?

6 A. There's a single DSP.

7 Q. So there's one DSP that -- that processes one
8 format at a time?

9 MR. AYERS: Objection; form.

10 A. Yeah.

11 Q. (BY MR. FLEMING) Okay. Looking at Claim 1 of
12 '585. It requires a receiver comprising a tuner.
13 Correct?

14 A. A receiver comprising a tuner. Yeah, that is
15 correct.

16 Q. And then can you read the rest of that paragraph.

17 A. [READING]: for receiving input RF signals and
18 for converting said input RF signals to intermediate
19 signals having an intermediate frequency (IF), said input
20 RF signals encoding information in one of a plurality of
21 formats.

22 Q. Okay. Turn -- can we introduce the -- another
23 exhibit. And that will be Exhibit 1004, which is the
24 Thomson reference. And that exhibit is the same number in
25 both IPR 2014-000728 and IPR 2014-00809.

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2 (Discussion off the written record.)

3 Q. (BY MR. FLEMING) Turning to Exhibit 1004. Do
4 you recognize this document?

5 A. Yes, I do.

6 Q. And this document is?

7 A. This is the Thomson reference.

8 Q. Turning to Figure 1. Can you tell me where in
9 Figure 1 a tuner is?

10 A. The tuner is not shown in Figure 1. The tuner is
11 described in the patent -- or referenced in the patent.

12 Q. And that is what?

13 A. I believe I stated it. Let me just look.

14 Q. I believe you were pointing to the outdoor --

15 A. Yeah. This describes a broadcast receiver, which
16 is a satellite receiver. The signals coming into the
17 satellite antenna are first downconverted, and then those
18 signals go through the tuner, and those signals as a
19 result are downconverted, and that results in the IF-Sat
20 that you see here. And that's the beginning of Figure 1
21 in terms of the signal flow.

22 Q. Turning to Figure 1. Can you tell me what
23 element is a channel filter and that corresponds at
24 Claim 1?

25 MR. AYERS: Objection; form.

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2 A. Yeah. Claim 1 helps us out here. It says: A
3 channel filter for receiving the intermediate signals.

4 And so there is intermediate signals in this
5 signal path and an -- it has an anti-aliasing filter for
6 filtering intermediate signals. That would be in this
7 block called "BP."

8 Q. (BY MR. FLEMING) If you look at the broad
9 Element 4, is that the channel filter?

10 MR. AYERS: Objection; form.

11 I think if he could finish his answer.

12 A. I'll finish my answer, if I may.

13 So we have an anti-aliasing filter, which is a
14 BP; analog-to-digital converter, which is Block 7; we have
15 a signal processor, which is Block 8; a plurality of
16 demodulators, which would be those Blocks 9, 12 and 13.

17 Yeah, those would be the channel filter.

18 Q. (BY MR. FLEMING) So then the channel filter does
19 not include the SAW filter?

20 A. No, it does not.

21 Q. And does not include the mixer 2?

22 A. I can -- there is an intermediate frequency
23 signal at Node 3, and there is one at IF-Sat. The claim
24 does not limit me in this regard. I can draw the box
25 either way in terms of this line of questioning --

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Q. In your declaration, did you --

A. Well, let me see what I did.

(Witness reviews document.)

A. If you'll allow me to read what I said.

[READING]: The channel filter of Claim 1 is somewhat of an abstraction. It comprises the anti-aliasing filter, analog-to-digital converter, a signal processor and a plurality of demodulators.

Q. (BY MR. FLEMING) So to clarify, then, the SAW filter is not part of the channel filter?

MR. AYERS: Objection; form.

A. It does not preclude the SAW filter. Just say that it -- it does include these things.

Q. (BY MR. FLEMING) So then the channel filter could be -- include the channel -- the SAW filter, or it could also not include the SAW filter?

A. Well --

Q. Is --

A. I am --

Q. Is the input to Node 3 an IF?

A. I would say that it includes -- the channel filter includes these things I've just described, and -- and would not include the SAW filter, would not include it.

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2 Q. Okay. On the anti-aliasing filter, then, you're
3 relying on Element 5?

4 A. That is correct.

5 Q. And your reasoning is that Element 5 would band
6 with limits?

7 A. Yes.

8 Q. Turning to Figure 2. Wouldn't you say that the
9 bandlimiting is shown in B?

10 A. No. There is bandlimiting, but that's not what's
11 critical.

12 Q. But it is limiting?

13 A. Certainly it's limiting. But the signals it got
14 through at E -- at F would completely destroy the function
15 of all downstream processing. You would be aliasing all
16 of these images into the baseband.

17 Q. But you would agree that B is bandlimiting?

18 A. What I would agree is that -- that the SAW filter
19 is a filter that has a bandwidth of 140 megahertz -- or 27
20 megahertz at a center frequency of 140 megahertz.

21 Q. Does not -- doesn't it bandwidth limit?

22 A. It does, yes.

23 Q. Turning back to Figure 1, AGC Control 6, what
24 does it do?

25 A. Controls the gain of that Amplifier 5.

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Q. I would like to introduce another exhibit,
Exhibit 2036.

MR. AYERS: Just for the record, we'll
object to the introduction of this exhibit.

Q. (BY MR. FLEMING) I would like to introduce
Exhibit 2036.

Can you tell me what the title says as far as --
or does it not just say "Filter Schematic Symbols"?

A. It says "Filter Schematic Symbols."

Q. And it's from what website?

MR. AYERS: Objection; form.

A. Microwaves101.com.

Q. (BY MR. FLEMING) So for a bandpass filter, the
signal is two -- three sign waves, with the first sign
wave having a left-to-right diagonal, and the third sign
wave having a left-to-right?

MR. AYERS: Objection; form.

A. That is a symbol for bandpass filter.

Q. (BY MR. FLEMING) Doesn't 8 show that? Element 8
of the -- sorry -- Element 8 of the Thomson reference,
Exhibit 1004?

A. Yes, it does.

Q. But it doesn't show that for Element 5?

A. No, it does not.

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Q. I would also like to introduce Exhibit 2022.

I'm introducing Exhibit 2022. Can you read the title of the exhibit?

A. It's "Graphic Symbols for Electrical and Electronics Diagrams (including Reference Designation Letters)."

Q. And can you read the first three lines above that?

A. It's: IEEE Standard, American National Standard, Canadian Standard.

Q. Turn to Page 2.

A. Okay.

Q. Can you tell me what 15.16.2 says?

A. It says: Frequency filter (bandpass).

Q. And it shows what kind of symbol?

A. It shows a block with a sinusoid-looking thing, three of them, stacked on one another with the top and with a left to right; bottom to top slash with a bottom with a left to right top -- bottom to top slash --

Q. And Figure --

A. -- with lines going across left to right.

Q. Thank you.

If we turn to Exhibit 1004, Thomson. Element 8 shows that same symbol?

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A. Yes.

Q. But Element 5 doesn't show that symbol?

A. No, it does not.

Q. I'd like to introduce Exhibit 2034.

I'm giving you a copy of Exhibit 2034. It is a
U.S. Patent. Can you tell me what the patent number is?

A. 5,831,689.

Q. And can you tell me the inventor?

A. Werner Boie.

Q. Can you tell me the assignee?

A. That would be Thomson Multimedia, S.A.

Q. Looking at Exhibit 1004, can you tell me who the
inventor is?

A. It's the same person.

Q. Can you tell me who the applicant is?

A. It's Thomson Multimedia, S.A.

Q. Turning to Figure 1 --

MR. AYERS: Of Exhibit 2034?

MR. FLEMING: I'm sorry.

Q. (BY MR. FLEMING) Of Exhibit 2034.

What does Element 7 show?

A. Oh. AGC.

Q. Okay. So turning to the spec. On Column 3,
Line 2, what does it say there, just that line there?

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A. [READING]: Connected to the input --

Q. Column 3, Line 3. I'm sorry.

A. [READING]: automatic gain control (AGC)

Circuit 7. In our Example the...

Q. Turning back to Figure 1. It shows Element 6.

And what does that element look like?

A. It looks like a variable amplifier.

Q. It looks like a -- I'm sorry. What is the symbol showing?

A. Variable amplifier.

Q. It shows a triangle. Correct?

A. Oh. Yes, it is a triangle.

Q. And it has an arrow?

A. It has an arrow going through it.

Q. Right.

Looking to the Thomson 1004. The symbol is the same as far as a triangle with an arrow through it?

MR. AYERS: Objection; form.

Q. (BY MR. FLEMING) I'm sorry. Element 5.

MR. AYERS: Objection; form.

A. It goes a different direction. But, yeah, it's similar.

Q. (BY MR. FLEMING) You're right. It's going to a different direction.

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But when you're looking at where the AGC Control 6 is in Thomson, it is above triangle, correct, of Element 5.

A. It is above the triangle.

Q. And it has a dotted line to the end of the arrow?

A. It does have a dotted line to the end of the arrow.

Q. And then if you turn to Exhibit 2034 --

A. Which is what? This?

Q. Yeah.

Figure 1, it shows the triangle again, Element 6, with an arrow, but the AGC 7 is below the triangle. Correct?

A. Wow. Yes, you are correct.

Q. And the dotted line goes to the bottom of the arrow?

A. Yep, it sure does.

Q. So it's showing the same symbol?

MR. AYERS: Objection; form.

MR. FLEMING: Okay.

THE WITNESS: That is a statement. Do you have a question?

Q. (BY MR. FLEMING) Is it not showing the same symbol?

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MR. AYERS: Objection; form.

A. It's a similar drawing. But this particular drawing has "BP" in it, which this symbol does not, so I can't say they're the same, especially in light of the fact that the spec says the bandpass -- internal bandpass limitation of the AGC amplifier.

Q. (BY MR. FLEMING) Before you jump to that --

A. Okay. Sorry.

Q. -- I'm still on my line of questioning.

A. Oh. Yeah. I'm sorry.

I was trying to describe what the symbol meant, and my understanding of the spec.

Q. But as far as the graphics go, other than BP, it's the same?

A. They're very similar, yes. One of them has a -- a shaded for prettiness, I guess. I'm not sure.

Q. Okay. I'd like to introduce Exhibit 2042.

(Discussion off the written record.)

Q. (BY MR. FLEMING) Okay. Exhibit 2042, I have handed to you, is a United States patent. Can you tell me what the patent number is?

A. 7,127,217.

Q. Can you tell me the assignee?

A. Silicon Laboratories, Inc.

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2 Q. Can we turn to Figure 1C. And can we look at
3 Element 180.

4 A. I see it.

5 Q. And what does that say?

6 A. It says "AGC."

7 Q. And it is feeding to Element 176. Correct?

8 A. That is correct.

9 Q. This is showing that those are a pair of
10 amplifiers. Correct?

11 A. That's what it appears to show, yes.

12 Q. So if we turn to Column 6. Can you read
13 Column 6, Line 65, through Column 7, Line 5.

14 A. Yes, I can.

15 Q. Could you, please.

16 A. [READING]: As with Figure 1A, the outputs of the
17 LNAs 102A and 102B are processed by mixer 104 to generate
18 real (I) and an imaginary (Q) signals. These signals are
19 processed by a programmable gain amplifier (PGA) 176,
20 which is controlled by the automatic gain control (AGC)
21 block 180. The output signals from the PGA 176 are then
22 converted to a digital I and Q values with I-path ADC 158
23 and Q-path ADC 156.

24 Is that far enough?

25 Q. Yes. Thank you.

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2 Okay. So the automatic gain control is being
3 used for what purpose --

4 MR. AYERS: Objection; form.

5 Q. (BY MR. FLEMING) -- in each of these references?

6 A. Well, one, I've not considered this patent or the
7 circuitry. I don't believe it's in my list of references.

8 Is this 1009? It's got a lot.

9 MR. AYERS: When you're getting to a good
10 stopping point, I could probably use a break.

11 MR. FLEMING: Okay.

12 Q. (BY MR. FLEMING) Can we go to column -- can we
13 go back, then, to help you out a little bit.

14 A. Yeah.

15 Q. Can we go back to --

16 A. I suspect that the amplifiers are -- they're
17 the -- they're controlling the gain in that serial path.

18 Q. Uh-huh.

19 A. That's what they're doing.

20 Q. Right.

21 A. And they're -- the AGC is adjusting the gain
22 according to the signal levels needed to get the maximum
23 dynamic range of the --

24 Q. Of the ADC --

25 A. Yes.

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Q. So if we go to Exhibit 2034 --

A. 2034 which, again, is?

Q. Patent No. 5,831,689. And if you look at --

A. Well, I'm not with you.

Q. I'm sorry.

A. Oh, that one. Okay. Oh, here it is, I'm sorry.

Okay. I have it.

Q. Okay. All right. And if we go to Column 3 and we look at Line 7. Can you read line -- starting with "the," which is at the --

A. Yeah.

[READING]: The AGC circuit ensures that the amplitude of the signal fed to the ADC 9 is within the acceptable limits for this converter.

Q. Just what you said?

A. Yeah.

MR. FLEMING: Do you want to take a break now, Peter?

MR. AYERS: Yeah, that's fine.

(Break.)

Q. (BY MR. FLEMING) Turning back to Exhibit 1004, which is the Thomson reference. And looking at Figure 2. Looking at the X-axis, that represents what, Dr. Holberg?

A. Frequency.

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Q. So that's in the frequency plane?

A. That is the frequency axis, yes.

Q. I guess before I go on. I -- what did you talk about while you were on the break?

A. We talked about his career, design --

Q. You didn't talk about anything on the --

A. We didn't talk about the case.

Q. Okay. All right. So it is a frequency domain that we're looking at?

A. Yes.

Q. And looking at this figure. Figure A is the signal before it goes into the SAW filter. Correct? Figure 2, Line A.

A. Yeah, that's the -- that's the signal at the input to the SAW filter.

Q. Okay. And then Figure 2, Line B is the output of the SAW filter. Correct?

A. That is correct.

Well, no, no. Hold on. I believe that shows the bandpass filter frequency response. That shows the -- if you were to do a impulse -- impulse response in the frequency domain of the SAW filter itself, it would have a shape that looks like that.

Q. Okay. Then -- Figure 2c, then, what is that

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2 showing?

3 (Witness reviews document.)

4 Q. (BY MR. FLEMING) If you'd look at Column 2,
5 Lines 47 through 49.

6 A. Yeah, I see that. I was looking at that. But
7 really they -- they coupled those together. They -- they
8 say components Figure 2a, 2b, 2c. What I think is -- and
9 I think it's actually -- could be mislabeled. I think
10 that C is actually the output of the SAW filter, even
11 though it's labeled pre-filtered Sat-IF.

12 Q. And then line -- Figure 2, Line D is showing
13 the oscillator of the Mixer 2 shown in Figure 1. Is that
14 correct?

15 A. That is correct.

16 Q. And then Figure E is the output of the
17 Oscillator 2?

18 MR. AYERS: Objection; form.

19 Q. (BY MR. FLEMING) Correct?

20 A. Figure what?

21 Q. Figure 2, Line 2 -- Line E --

22 MR. AYERS: Objection; form.

23 Q. (BY MR. FLEMING) -- shows what?

24 A. It's -- it says: Input signal of the DAC.

25 I believe that that's an error in the -- I think

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2 they meant the ADC.

3 But the spec does not specifically call out on
4 each line by itself and describe what it is.

5 Q. So you believe, then, Figure 2e is showing input
6 to the digital-to-analog converter? Analog-to-digital
7 converter?

8 A. Yeah, I believe it is.

9 Q. Okay. I would like to introduce -- I apologize.
10 I thought I had it laid out here. 2035.

11 Dr. Holberg, can you read the title of this
12 Chapter 7?

13 MR. AYERS: Let me just object to the
14 introduction of this exhibit for the record, please.

15 A. "Subsampling Receivers with Applications to
16 Software Defined Radio Systems."

17 Q. (BY MR. FLEMING) If you could read for me in the
18 introduction on Page 1, the third paragraph.

19 A. [READING]: Different receiver architectures have
20 been proposed to overcome this problem, such as direct
21 conversion, low -- [11], low intermediate frequency (IF)
22 [12], and subsampling reference [13,14]. In subsampling
23 receivers, the RF signal is sampled using a frequency
24 lower than twice the maximum input frequency, but larger
25 than two times the signal bandwidth. One of the low

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2 frequency replicas resulting from the subsampling -- from
3 the -- sorry -- from the sampling process, which contains
4 the baseband signal, is then directly digitized.

5 Q. Turning back to Exhibit 1004. Is the Thomson
6 using subsampling?

7 A. Yes.

8 Q. So the subsampling is a process of having
9 produced replicas, according to Page 1 you just read of
10 Exhibit 2035. Correct?

11 MR. AYERS: Objection; form.

12 A. Restate your question.

13 Q. (BY MR. FLEMING) We have agreed that Thomson
14 does teach subsampling?

15 A. I have.

16 Q. Okay. And then what is subsampling?

17 MR. AYERS: Objection; form.

18 A. Well, I'll re- -- this does a good job of
19 explaining it, I think. It says: Different receiver
20 architectures have been --

21 Well, let me read subsampling: Subsampling
22 receivers, the RF signal is sampled using a frequency
23 lower than twice the maximum input frequency.

24 So that's what subsampling is.

25 Q. (BY MR. FLEMING) So if we turn to -- let's

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2 see -- back to the Thomson reference and look at Figure 2.
3 Doesn't Figure 2d show the subsampling waveform?

4 MR. AYERS: Objection; form.

5 A. No waveforms are shown in this figure. Waveforms
6 are time domain illustrations of signals.

7 Q. (BY MR. FLEMING) Excellent point.

8 Is it not showing the replicas of the
9 subsampling?

10 MR. AYERS: Objection; form.

11 A. Yes, it -- they are -- the replicas are
12 illustrated there.

13 Q. (BY MR. FLEMING) Can you explain a little bit
14 more about what is the purpose of a replica, why is --
15 what they are?

16 A. Well, they don't have a -- necessarily a purpose.
17 Whenever you multiply two sine waves of two different
18 frequencies, let me -- let me say one frequency just to
19 keep the terminology straight is A. So A equals Ω
20 1 -- $\Omega_1 t$ and B is equal to $\Omega_2 t$. So you multiply
21 $\sin A$ times $\sin B$ -- it's a trigonometric identity
22 taught in the 11th grade -- you end up with some
23 indifference frequencies. Those are the replicas, if you
24 will, in the context. They're the images that result from
25 the multiplication of two frequencies.

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2 In this case one of the frequencies is the
3 sampling frequency, and the other frequencies are those
4 frequencies in the band described by what's shown in E.

5 Q. Can you turn to Page 6 of Exhibit 2035.

6 A. Okay.

7 Q. Can you read the first paragraph under 4.1
8 "Concepts of subsampling."

9 A. [READING]: As mentioned before, moving the ADC
10 close to the antenna increase --

11 [READING]: As mentioned before, moving the ADC
12 closer to the antenna increases the flexibility of the
13 receiver; however, this conversion just after the antenna
14 prohibitively increases the ADC's bandwidth and sampling
15 frequency requirements. Nevertheless, the bandwidth of a
16 bandpass signal is usually a fraction of its center
17 frequency, so that it is possible to subsample the signal
18 (i.e., violating the Nyquist condition), thereby avoiding
19 aliasing replica -- between replicas.

20 Q. So isn't it true that the lower order replicas
21 have the bandwidth signal contained in that envelope?

22 MR. AYERS: Objection; form.

23 A. I'm not sure I understand the question. I -- I
24 agree that if you look at this figure, it shows the
25 replicas --

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2 Q. (BY MR. FLEMING) Okay.

3 A. -- that result from the sampling.

4 I would also point out that this paragraph is in
5 error. You do not violate the -- the Nyquist condition
6 was properly stated in paragraph -- a different receiver
7 in the paragraph, but it's improperly noted here.

8 Q. Okay. Let's start at the top, then. If you turn
9 to Thomson Figure 2. That's Exhibit 1004. The IF-Sat
10 input signal is the 2-gigahertz carrier band signal which
11 is the tuner output signal which contains the signal shown
12 in Figure 2a. Is that not correct?

13 MR. AYERS: Objection; form.

14 A. The -- so the IF-Sat signal is what -- you kind
15 of confused me. You said the 2-gigahertz signal?

16 Q. (BY MR. FLEMING) Yes. The carrier signal.

17 A. Yes. Let's see. It's downsampled a couple of
18 times. Hold on. Let me -- let me make sure that...

19 No. The IF-Sat signal is -- is at 140 megahertz.
20 It's not a 2 gigahertz.

21 Q. Then the SAW filter 1 outputs a FIR signal that's
22 consistent of pulses at 140 megahertz?

23 A. I didn't say that.

24 Q. I'm asking is that your --

25 A. No, it's not a -- it's not an FIR filter.

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Q. I said "signal."

A. You said -- I thought you said that's not a FIR signal.

Q. Okay.

A. Maybe -- please restate the question, and I'll do my best to answer.

Q. Okay. Let's go to -- is Mixture 2, does it mix the 7 megahertz frequency shown in Figure 2c and 2e with the 65 megahertz frequency --

MR. AYERS: Objection; form.

Q. (BY MR. FLEMING) -- to the frequency range of 140?

A. Let me tell you what that does. You have IF-Sat at -- at 140 megahertz going into the SAW filter with a center frequency around 140 megahertz. That then is mixed with the local oscillator (LO) in the figure shows 70 but in the text it says 65. And then the output of that is then -- the images associated with that summoned product that I just described a little while ago that you would naturally get from the product at sine waves of two different frequencies.

Q. In that figure does it show the frequency response of Element 5?

A. When you say "that figure," I assume you're

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referring to Figure 2 --

Q. Figure 2, yes.

A. Of Element 5? No, it does not.

Q. So turning back to Exhibit 2035. You had read that -- in the third paragraph that: One of the low-frequency replicas results from the sampling process, contain the baseband signal.

MR. AYERS: Objection; form.

Q. (BY MR. FLEMING) Isn't that what it says?

A. So which reference? Back at the different receiver architectures?

Q. Exhibit 2035. Third paragraph, last sentence.

A. Oh.

[READING]: One of the low-frequency replicas resulting from the sampling process, which contains the baseband signal, is then digitized.

Okay. I read that signal. So what's the question?

Q. So what does that mean?

MR. AYERS: Objection; form.

A. It says that the -- essentially it's saying there is multiple replicas, and one of the low-frequency replicas resulting from the sample -- sampling process contains the baseband signal, and is digitized.

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Q. (BY MR. FLEMING) Right.

Turning to Figure 1 of the Exhibit 1004, Thomson.
Is -- do they -- once you get past Element 8, is there not
low-pass filters?

MR. AYERS: Objection; form.

A. Past Element 8?

Q. (BY MR. FLEMING) Yes.

A. Yeah, there's a -- 14, 15 and 10 contain low-pass
filters.

Q. Could they not be filtering out the higher order
replicas?

MR. AYERS: Objection; form.

(Witness reviews document.)

A. My understanding -- in order to answer your
question, let me explain my understanding of the circuit.

When you're coming out of Mixer 2, you have
multiple images of the -- resulting from the -- the mixing
process with the IF-Sat that's been filtered by the SAW
filter. That results in those images as shown in
Figure 2.

Before going into the A/D converter, you've
got -- you -- you cannot sample all of those images
because they will -- they will alias into one another and
it will be a useful signal D output.

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2 Therefore, in -- in my understanding of -- of
3 Thomson, which I believe is correct, the AGC not only
4 serves as a bandpass filter, which it actually mentions at
5 the bottom of Column 2, and that limits the input to the
6 A/D. As to the particular image of interest coming out of
7 the A/D, you no longer have to deal with all of those
8 images. They would have been -- if they had been at the
9 front of the A/D, then -- at the sampling point, you would
10 have corrupted the signal.

11 Q. (BY MR. FLEMING) So you're ignoring the fact
12 that they're using subsampling?

13 A. No, I'm not. I'm saying that --

14 Q. What is the purpose of subsampling, then?

15 MR. AYERS: Objection; form.

16 Could you let him finish his answer, please.

17 A. That's the result -- the alpha signals, that the
18 images that you're referring to that result from those
19 first samples -- first mixer have to be eliminated, or
20 blocked.

21 The result of the A/D, in D, you're going to have
22 images resulting from any sampling process. That's
23 handled by the -- by the Block A.

24 Q. (BY MR. FLEMING) Is there anything in Figure 2
25 that shows the blocking of that signal?

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2 A. Again, the antecedent of that in this particular
3 case would be helpful.

4 Q. You said that the -- that there is a
5 trigonometric --

6 A. Relationship.

7 Q. -- relationship of when you mix a signal, that
8 you're going to get two components. One is the frequency
9 of the two frequencies mixed and added, and the other
10 component was the frequencies subtracted. Is that not
11 correct?

12 A. At least that.

13 Q. And what I'm asking, is there anything in
14 particular in Figure 2e showing that they're filtering out
15 the higher order trigonometric figure?

16 A. Yes, by virtue of the fact that they're
17 identifying it as the input of the ADC, if you'll allow me
18 to correct their patent, because there's no DAC here.

19 But that -- that signal is just the image of
20 interest because it's been filtered by the bandpass
21 filter. That's my understanding of the way it works. And
22 that's the way it would be designed.

23 Q. Turning to -- what you're relying on, I assume,
24 that it has a bandpass filter contained in Element 5. I
25 believe that's -- you're relying on Column 2, Line 57,

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2 through Column 3, Line 3?

3 A. Yes, that's -- it says the down-converted
4 signal --

5 Sorry.

6 [READING]: The down-converted IF signal then
7 goes to AGC amplifier 5 with an internal bandpass
8 limitation before the IF signal enters the input of the
9 A/D converter.

10 Q. And then what does the next sentence say?

11 A. [READING]: The AGC amplifier 5 has to make sure
12 that the full dynamic range of the A/D converter 7 is
13 exploited to keep the quantizing noise to a minimum.

14 Q. So the focus of those two sentences is about
15 adjusting the amplification so that it would be the full
16 range of the A/D converter and filter out any noise? Is
17 that not a reasonable reading of that?

18 A. I'm not sure how you can read that sentence --
19 those two sentences and determine a focus. They're
20 describing both.

21 Q. But it says "internal bandpass limitation." It
22 does not say "bandpass filter," does it?

23 A. A person of ordinary skill in the art would
24 understand that's a bandpass filter function. You're
25 blocking signals that you don't want to get through the

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amplifier.

Q. If you turn to Column 3, Lines 9 through 11.
Could you read that sentence.

A. [READING]: The A/D converter 7 is operated in the subsampling mode, but this does not cause any aliasing problem because of the bandlimited input signal.

Q. So is -- is the bandlimiting or is it the sub- -- the subsampling that prevents anti-aliasing?

A. It is the bandlimited input signal. You have to band limit the input signal in order for the subsampling to work. That's what it's saying.

Q. Then turning back to Figure 2. The only -- only line that shows bandlimiting has to do with a SAW filter?

A. It can't be the SAW filter. The SAW filter --

Q. That's the only point that limits --

A. I disagree. The bandpass filter block 5, as it's noted here in the bottom of Column 2, is bandlimiting. It is the anti-aliasing filter. And it's limiting the frequency range that's sampled by the A/D converter.

Q. So subsampling has nothing to do with it?

A. Subsampling has -- has to do with how you would band limit.

If you were not subsampling and you were sampling at above the Nyquist rate twice -- twice the frequency of

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2 the absolute frequency coming in, you would not -- then
3 you would band limit with a low-pass filter.

4 When you subsample, you have to use the strictest
5 interpretation of Nyquist, which says you have to
6 sample -- you have to band limit -- you have to sample at
7 least twice the bandwidth of the signal being sampled.

8 Therefore, when you're doing these kinds of
9 operations, it has to be a bandpass filter when you're in
10 a subsampling mode. It's all tied together.

11 Q. Doesn't the SAW filter show bandlimiting to
12 27 megahertz, or thereabouts?

13 A. Yes, it does.

14 Q. And doesn't that meet the formula that we just
15 read in Exhibit 3 -- 2035?

16 A. If it were sitting in the same location and the
17 signal changed as -- as the amplifier 5, yes. But it's
18 not. It's in the wrong place. It fails because -- awhile
19 ago I explained when you have two sinusoids molting, you
20 get the sum indifference. The reality is the mixer may
21 have -- may not be perfect sinusoids. Early mixers were
22 square waves. So you'll have multiples -- you know, odd
23 harmonics that get mixed in.

24 The bottom line is, the signal at this point has
25 images that you have to eliminate before they go into the

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A/D, and that's what the bandpass filter's done. The SAW filter cannot do that.

Q. Could the upper replicas have those sorts of problems but the lower replicas have the bandwidth signal in it so you don't have to worry about it? So as long as you pick that lower order replica, you will be able to avoid anti-aliasing problems?

A. At what point? The input of the A/D?

Q. The output the A/D with the subsampling?

A. Well, I'm trying to understand which -- the replicas associated with coming out of mixture 2 or the replicas --

Q. No, the replicas that we're talking about in Figure 2, Line G.

A. Those -- those replicas, you pick the one you want. There's not an aliasing problem.

Q. But Exhibit 2035, the third paragraph, clearly says that the lower order replicas are the ones that you would want to select?

A. I'm not sure what they're --

Q. Because they contain the bandpass signal. Is the point of --

A. Hold on a second. Was that on the second page that you referenced?

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Q. First page.

(Witness reviews document.)

A. It just simply says: One of the low frequency replicas.

Q. (BY MR. FLEMING) Let's move on.

If we turn to your Paragraph 50 of your declaration. And you have a corresponding one in -- in your declaration for Exhibit 1009 for IPR 2014-00728. And you have an identical paragraph in Exhibit 1009 for the IPR 2014-00809.

A. Let's make sure that we know that 50 is 50 in both documents and we're talking about the same thing.

Q. Well -- yeah. I'm not saying it's Paragraph 50. It is a similar --

A. Oh, okay.

Q. On Page 29 --

A. Okay. I'm there.

Q. -- of the 728. Second full sentence. Could you read that to me.

A. [READING]: Thomson further discloses in the QPSK demodulation section, "synchronous demodulators 12,13 for the QPSK quadrature demodulation and low pass filters 14,15 providing signal Q, I at outputs of Circuit 4."

Q. And then you -- and in Paragraph 50 you go on to

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state in the next sentence -- could you read that to me.

A. Okay.

[READING]: One of ordinary skill in the art would understand that digital TV signals (such as MPEG) digitally encode the video and audio information in a single signal, and would know that the Q and I baseband signal components must carry both the video and audio information for the TV signals of Thomson to serve the expressly disclosed purpose of the digital TV receiver.

Q. Does Thomson specifically mention that Q and I baseband signal components carry both video and the audio baseband signals?

A. No, I don't believe it does.

Q. Does Thomson mention MPEG?

A. Thomson does not.

Q. Can we look at Thomson Exhibit 1004. Column 2, 39 through 46. And could you read that to me? It starts with the word "further."

A. [READING]: Further are provided a picture carrier regenerator 11 generating carrier with phase of 0 degrees and 90 degrees for QPSK demodulation, synchronous demodulation -- demodulators 12,13 for QPSK quadrature demodulation and low pass filters 14 -- providing signal Q,I at the outputs of Circuit 4.

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2 (Discussion off the written record.)

3 Q. (BY MR. FLEMING) So in Column 3, Lines 40
4 through 48. Could you read that.

5 A. [READING]: For the reception of digitally
6 transmitted video signals the analog pre-processing blocks
7 can be kept.

8 Through how far?

9 Q. Through 48.

10 A. Okay.

11 [READING]: In the digital part a quadrature
12 mixer and special carrier regenerator have to be added in
13 order to demodulate QPSK modulated signals. The carrier
14 regenerator can be controlled by the digital QPSK
15 demodulator which is not depicted in Figure 1. The
16 quadrature demodulator is followed by lowpass filters to
17 produce and in phase and a quadrature symbol pattern at
18 the output.

19 Q. Is there any other part of the Thomson disclosure
20 that talks about digital demodulators as, in particular,
21 audio?

22 MR. AYERS: Objection; form.

23 A. The only mention of audio is -- is earlier in the
24 paragraph, I think. Or earlier in that column.

25 Q. (BY MR. FLEMING) So when we look at the abstract

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2 of Thomson -- or the -- I guess it's called the "Gist of
3 the Invention."

4 It says normally that it takes -- it says that:
5 A single A/D converter is required only and allows high
6 quality FM demodulation.

7 Right?

8 A. It says that, yeah.

9 Q. What does the abbreviation "Q" mean?

10 A. Quadrature.

11 Q. And what does "I" mean?

12 A. In phase.

13 Q. On Page 30 of Paragraph 53 of Exhibit 1009 on
14 IPR 2014-00728. And you have a similar paragraph in your
15 other declaration for IPR 809. You state that: the '585
16 patent describes a DSP to implement the functions
17 performed by the "signal processor" of Claim 1.

18 A. I'm sorry. We're in a different place.

19 Q. Paragraph 55.

20 A. You said 53.

21 Q. Oh, I'm sorry.

22 A. I'll go over to 55. I see the paragraph now.

23 Q. You state that -- the first line -- can you read
24 the first two lines of --

25 A. Yes.

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2 [READING]: As explained above in Paragraph 25
3 above, the '585 patent describes a DSP to implement the
4 function performed by the "signal processor" of Claim 1.
5 Such an implementation was notoriously well known in the
6 art, as shown by Harris among many others. DSP-based
7 adapted filters were commonplace at the time of the '585
8 patent.

9 Do you want me to keep reading?

10 Q. No. You're fine.

11 A. Okay.

12 Q. Thank you.

13 Why don't we turn to Harris.

14 A. I don't think you gave me Harris.

15 Q. Okay. Harris is 1005. What exactly is the
16 modifications you're going to do to Thomson's Figure 1,
17 Exhibit 1004, with the Harris reference?

18 A. I can implement the Filter 8 block which is a
19 digital signal processor with -- with using Thomson as my
20 reference -- I mean, using Harris as my reference.

21 Q. What exactly in Harris are you relying on as far
22 as -- what -- what is actually the structure?

23 MR. AYERS: Objection; form.

24 A. Harris decimation filter (DDF) has a 512 tap
25 filter. I mean, I describe it there.

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Q. (BY MR. FLEMING) So you're saying Figure 4 is the -- is the structure?

A. Let me look. I believe that's Figure 4.

(Witness reviews document.)

A. Yeah.

Q. (BY MR. FLEMING) So -- and Figure 4 gives a part number. Correct?

A. Yes.

Q. And what is that part number?

A. That's HSP43220.

Q. And it says "DDF." Right?

A. DDF. Right.

Q. What does "DDF" stand for?

A. Digital decimation filter.

Q. Is a DDF normally thought to be a digital signal processor?

A. Yes.

Q. The article mentions a digital signal processor, but it doesn't refer to that as the digital signal processor.

A. That's fine.

Q. I'd like to introduce Exhibit 2006.

MR. AYERS: And just for the record, we object to the introduction of Exhibit 2006.

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Q. (BY MR. FLEMING) Can you read the title of -- on the right-hand corner of the Exhibit 2006?

A. "HSP43220 - Data Sheet - October 10, 2008 - FM2486.10."

Q. Are you familiar with this data sheet?

A. I think I have a copy of this data sheet, but I'm not certain.

Q. So just to be clear, your proposal is to take HSP43220 and replace it with a Thomson Filter 8?

MR. AYERS: Objection; form.

A. No. This is an example. Digital signal processors were well known. This is just one of a sea of examples of digital signal processors.

Q. (BY MR. FLEMING) But you're --

A. This one -- I refer to this one simply because it -- the -- that particular reference contains a very nice communication signal path where -- where a digital signal processor was used, and this was part of that digital signal processing signal path.

I'm not saying that this exact filter is what is being used or would be used. I'm saying it's teaching --

Q. The grounds was -- I believe was that Claim 1 was rejected as being obvious over this Thomson reference in view of Harris.

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2 A. Yeah. What I'm saying there is, Harris teaches
3 me -- is one example of teaching me how to design a
4 digital signal processor to do filtering.

5 Q. And then you're relying on Figure 4?

6 A. Yeah, as -- as an example.

7 Q. So then this --

8 A. Yeah.

9 Q. -- this Figure 4, then, is what you're going to
10 use as a part to substitute for the Thomson Filter 8?

11 MR. AYERS: Objection; form.

12 A. No. I mean, that's not the way -- when I -- when
13 I did this work -- what I was saying was, that, "Here's an
14 example of a digital filter ten years plus, a decade prior
15 to the '585 patent, and it was used in a signal processing
16 application of a -- of a radio." And there is some --
17 this is just one example, but I used it because it
18 demonstrates -- and what -- what -- what Harris says --
19 give me a minute.

20 This is the point, is that "With the advent" --
21 the end of Page 7, the last paragraph of this article:
22 With the advent of the 10s of megasample per second ADCs
23 and VSLI implementations of a digital tuner, the first
24 step in pushing the DSP toward the antenna has been taken.

25 Ten years prior.

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2 And this is just an example. He's just showing
3 an example. I don't have to use -- I don't think I have
4 to use that particular filter. I'm just showing that
5 people have done this.

6 Q. So are you saying, then, that this particular DSP
7 43220 won't work?

8 A. I don't know. I haven't investigated it. But I
9 don't think that that particular --

10 Q. So that's not your position at all, then?

11 A. No.

12 MR. AYERS: Objection; form.

13 A. No. My position was to demonstrate that digital
14 signal processors used in -- in radio signal paths were
15 well known, and this is an example of this being applied
16 to that signal path in the Harris. And a person of
17 ordinary skill in the art would look at that and say,
18 "Wow, that guy built a radio, and he got the A/D and the
19 DSP up close to antenna. I wonder if I can do it. He
20 taught how to do it in that application. All I had to do
21 is modify this understanding to the proper filter
22 coefficients and the proper formats of how I want to
23 filter to get the result I need for your TV application --
24 or for this TV application."

25 Q. (BY MR. FLEMING) Turning back to Paragraph 55.

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2 You show Figure 4 as the structure in which you're going
3 to substitute for the adaptive filter.

4 MR. AYERS: Objection; form.

5 A. Paragraph 55: As explained above in Paragraph 25
6 above, the '585 patent describes the DSP to implement the
7 function performed by "the signal processor" of Claim 1.
8 Such an implementation was notoriously well known in the
9 art, as shown by Harris among others -- other references.
10 DSP adaptive filters were common place at the time of the
11 '585.

12 That's all I'm trying to show you.

13 Q. (BY MR. FLEMING) So in Paragraph 56 on Page 33,
14 can you read that sentence?

15 A. Yeah.

16 [READING]: As shown above, the Harris decimation
17 filter (DEF) includes a 5 12-tap FIR filter coupled to a
18 coefficient RAM that stores the FIR filter coefficients.

19 Q. So your -- the combination, is it not, the ground
20 was based upon the Harris reference in combination with
21 Thomson?

22 A. Teaching how to do a digital filter in a FIR
23 filter format, that's adaptive. That's what I was trying
24 to illustrate. That's what I'm illustrating.

25 I never intended -- I don't think the words would

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indicate that I said "use this filter, exact filter in the Thomson filter as a replacement." I don't read that into what I wrote. I certainly didn't intend it to be that way. Absolutely not.

Q. So are you saying, then, that Part 5 SP 43220 is not adaptive?

MR. AYERS: Objection; form.

A. No, I'm -- it talks about the whole adaptive aspect of this. It's programmable.

Q. (BY MR. FLEMING) So you have --

(Simultaneous speaking.)

A. You have the comb filter coefficients EN1-5. It's changeable, yes.

Q. HSP43220, Exhibit 2006, you're saying is programmable?

A. Well, I see -- I see inputs of coefficients of -- comb filter coefficients going into comb filter. It's been a while. I believe I've seen this, but let me look at the...

(Witness reviews document.)

A. Yes, I believe it is. I think it probably says it in the Harris article.

Q. (BY MR. FLEMING) If you look at Exhibit 2006, Figure 1, Figure 2, Figure 3 shows the structure?

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2 A. Uh-huh. Yes.

3 Q. Is there an ALU there?

4 A. No. It says it's --

5 Q. Does it have a programmable memory?

6 A. No. It has -- you interface it with a
7 microprocessor that does the programming.

8 Q. So you're saying that you would use a
9 microprocessor to do the programming as it's running?

10 A. No. Anyone that teaches that you -- that teaches
11 the concept -- and it's almost so trivial to me.

12 Harris is showing --

13 No, you don't -- you don't need a microprocessor.

14 And one of ordinary skill in the art would look
15 at that and say, "You know what? I need three different
16 filter functions. You know, all I need is memory to store
17 the coefficients for these cases. I don't need all of
18 these memory -- all of these cases." That's what a person
19 of ordinary skill in the art would say.

20 Q. So you're saying, then, that the HSP43220 can
21 update its coefficients as it's operating?

22 MR. AYERS: Objection; form.

23 A. Well, I don't know if it can.

24 Q. (BY MR. FLEMING) Then how can it be adaptive?

25 A. You can -- you can --

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Q. You can preset it, and then that's how it would filter?

A. Well, you -- then you change it, and then there's an impulse response as a result of that change. As long as your system allows for that change, you change it. That's not a problem.

Q. Can you change this while it's operating?

A. Yes, you can. I believe you can.

Let's see.

(Witness reviews document.)

A. I mean, I didn't investigate that. But in principle, the concept is trivial.

Q. (BY MR. FLEMING) Would you look at Figure 5 of Exhibit 2006. It discloses you have to -- if you read the third sentence.

A. Do you want me to read it?

Q. Yes, please.

A. [READING]: The first write load C19 through C4; C3 through C0 are loaded on the second write cycle. As the coefficients are written into this register they are formatted into a 20-bit coefficient and written sequentially into the Coefficient RAM sequentially starting with address location zero.

Q. If you'd look -- when you reprogram the control

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2 registers, as well as the coefficients that are shown on
3 Figure 12, isn't this done initially before you operate
4 the device, preprogramming it, not programming it? Or
5 have any way to program these coefficients while the part
6 is operating?

7 MR. AYERS: Objection; form.

8 Q. (BY MR. FLEMING) In other words, it's showing
9 it's going into a PROM?

10 A. Where is that showing, the PROM?

11 Q. If you look at Page 10.

12 A. Okay.

13 Q. Look at the third paragraph. It talks about
14 reloading coefficients.

15 A. Uh-huh.

16 Q. And it talks about there's two methods. And then
17 it talks about when the programming is complete, and that
18 they restart.

19 A. Okay.

20 Is there a question hanging in the air?

21 Q. Yes.

22 A. What was it?

23 Q. Does this show that it could be operated as an
24 adaptive filter while it's operating?

25 A. Well, maybe the problem is I don't -- let's see

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where I used it. I think I said "adaptive filter."
Right? I said Thomson, because the adaptive filter is
design to support various operational -- various
operational modes.

In this concept, the adaption is made for the
different modes of operation. Not in the sense of an echo
canceler adaptive filter where you're continuously
adapting in real-time. For the continuous -- I think your
point is that you wouldn't want to do this in a continuous
adaptation scenario, and I think I agree with you.

Q. Okay. Let's move on.

On Column 4 -- I'm sorry. Page 4, Column 2 of
Exhibit 1005, Harris.

A. Column -- orient me again.

Q. I'm on Page 4, Column 2 of Harris, Exhibit 1005.
And I'm as lost as you are. Sorry.

A. Column 4 or --

Q. Page 4, Column 2.

A. Okay.

Q. If you look at the second paragraph, the last
sentence --

A. Second complete paragraph?

Q. First complete paragraph. Sorry. It starts with
"the gap."

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2 A. [READING]: The gap between the digitized
3 wideband signal and the computational power of a
4 microprocessor is bridged by a digital down converter
5 which extracts the narrow band signal of interest while
6 reducing the data rate to 10-100 kilosamples per second
7 range.

8 Q. What does that tell you as far as in terms of
9 sampling rate?

10 A. Well, it says 10-100 kilosamples per second.

11 Q. So that -- that is the input sampling rate?

12 A. I think -- let me just make sure.

13 (Witness reviews document.)

14 A. It's the -- it's the data rate...

15 (Witness reviews document.)

16 A. At that point I think it's just the -- I don't
17 think it's the sample. The sample rate, it says in the
18 next paragraph is -- is 2.5 times the highest frequency.
19 Let's see what the sample rate actually is.

20 (Witness reviews document.)

21 A. It says it's sampled at 33 megasamples per second
22 on Page 5.

23 (Witness reviews document.)

24 A. Yeah. And it says on Page 4, it says it
25 digitizes --

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2 Q. (BY MR. FLEMING) So if we turn to --

3 MR. AYERS: Wait. Let him finish.

4 MR. FLEMING: I'm sorry.

5 A. The NCOM, the numerically controlled -- I
6 guess -- the numerically controlled oscillator modulator.
7 The NCOM takes a wideband output and digitizes it at rates
8 of 33 megasamples per second. So I think it's digitizing
9 at 33 megasamples per second.

10 Q. (BY MR. FLEMING) So I will point to
11 Exhibit 2006. And it does show you the DBF filter
12 specification, which shows the input sample rate is --

13 A. Is that 2006? That's the --

14 Q. Yeah, 2006.

15 A. And figure what?

16 Q. It's not a figure. It's the very first top
17 point, which is the filter specification. The input
18 sampling rate is 33 megahertz. So that's consistent with
19 what you just said?

20 A. Yeah, that is consistent.

21 Q. Does the Harris reference, though, teach that
22 it -- there is a decimation of that sampling rate, and
23 that's why they're talking about -- that's why they're
24 talking about 10-100 KSPS range?

25 A. Well, it may be. I mean, I don't know.

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Q. Well, if you look --

A. I didn't analyze that.

I do know the decimation -- the result of decimation, you reduce the -- you're taking serialized information in parallel. You do reduce the sample rate.

Q. So when you look at Figure 4, the --

A. Yeah, that's what's going on there, yeah.

Q. So that's why -- so then we do only have in the 10-100 range, in the end result after decimation?

A. After decimation.

Q. Decimation.

A. Yeah.

Q. So can this filter filter at the 2- -- 27 megahertz signal?

A. No. But this was in 1992 when your -- when your computer was operating at 50 megahertz versus 2001 when it's operating at 2-gigahertz.

Q. Harris' application is suggested. Can you tell me what that application for their receivers are?

A. They mention a few examples, which are cellular telephones, mobile radio, and wireless LANs are but a few examples of potential applications of DSP.

Q. Does Harris mention television receivers?

A. No.

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Q. Is designing television receivers more difficult than designing telephone cellular receivers?

A. I can't comment on that. I don't know.

Q. Does television receivers require a larger bandwidth than television -- telephone cellular receivers?

A. I've not studied the difference.

Q. Can telephone cellular receivers tolerate less channel filtering precision than television receivers?

A. I don't have an answer.

Q. At the time of the '585 patent, the maximum channel bandwidth of cellular telephones was around?

A. I don't know.

Q. Would the maximum channel bandwidth of television be much greater --

A. I don't know.

Q. -- than cellular telephones?

A. As I said a minute ago, I did not analyze the difference.

Q. Thomson. Does Thomson disclose the maximum bandwidth of the television signal?

A. Well, coming in here to 27 megahertz, that's the SAW filter. So that maximum bandwidth at this particular location in the signal chain.

Q. You're pointing to where?

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A. The SAW filter is a 20- -- has a 27 megahertz bandwidth.

Q. And it's centered around what frequency?

A. 140 megahertz.

Q. What is the assumed bandwidth of the IF signal, the output of the tuner shown in Figure 2, Line A of Thomson?

A. I don't know if it states in the -- in the paragraph. Clearly it's bigger than 27 megahertz, if that's -- if that's helpful for you.

Q. Okay. What is the bandwidths that Harris talks about?

(Witness reviews document.)

A. I suspect you know. If you want to point me there and ask me the question.

Q. (BY MR. FLEMING) Okay.

A. So the typical system in this application may be capable of extracting a signal as narrow as a few kilohertz out of a spectrum that spans hundreds or even thousands of megahertz.

Q. How about looking at Page 6, Column 1.

A. I'm looking at it.

Q. I am too. Sorry.

A. Okay.

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Q. Second paragraph. Column 2.

A. Beginning with what words?

Q. Beginning with "using structures similar to the one shown in Figure 2."

A. I'm sorry. I don't --

Q. Okay. I understand. It's small print for me too.

Well, if you look at -- I'm on Page 6 of the Harris reference, Column 2, and I'm in first full paragraph.

A. Okay. You said second, I thought.

Q. Yeah --

A. Okay. So now I'm on the first full paragraph which starts with "the reduction of."

Q. Yeah. And if you come down and it's -- to the next sentence which says: Using a structure similar to the one shown in Figure 2, signals within a 13 megahertz IF may be downconverted to baseband and filtered by the DDFs to extract signals with bandwidths of 100 -- from 100s hertz to a few hundred kilohertz.

Is that correct?

A. I don't doubt anything you say, but I can't find where you are.

Q. This is where I am (indicating).

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A. Okay. I thought you said Column 1.

Q. Page 6, Column 2.

A. Okay.

Q. Maybe you can help me out.

A. Well, I asked you a second ago does it start with "the reduction of" and you said yeah, so --

Q. I'm sorry.

A. -- I was off.

Q. No problem.

A. Okay. It starts with "The tuning and filtering capabilities."

Q. Yeah. And it's the next sentence.

A. Got it. I'm there. "Using a stru-" --

Okay. All right. Sorry.

Q. No problem. It's really teeny print.

A. Well, I had my -- I was prepared. I had my 3.25s.

Okay.

[READING]: Using a structure similar to the one shown in Figure 2, signals within a 13-megahertz IF may be downconverted to baseband and filtered by the DDFs to extract signals with bandwidths from 100s of hertz to a few hundred kilohertz.

Is that as far as you want me to go?

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2 Q. Yeah. So that's the filter bandwidth that Harris
3 is dealing with?

4 A. In -- yes. In this exemplary description, yes.

5 Q. Okay. So is there anywhere in Harris that
6 mentions processing bandwidths in the Thomson range of
7 100 megahertz?

8 A. Yeah, I read to you before. He didn't give
9 specific, numbers, but he said: With the advent of the
10 10s of megasample per second ADCs and VLSI implementations
11 of a digital tuner, the first step in pushing the DSP
12 toward the antenna has been taken.

13 [READING]: Further advancements in the
14 respective technology areas guarantee higher sampling
15 rates coupled with higher levels of integration with
16 digital tuning and demodulation. The declining cost of
17 technology is making DSP a desirable alternative for an
18 expanding spectrum of communication problems.

19 Q. But does that mention bandwidth?

20 MR. AYERS: Objection; form.

21 A. No. But it's implicit. It's talking about the
22 whole --

23 Q. (BY MR. FLEMING) But the only example --

24 A. No, it does not.

25 Q. Does Harris teach the FIR filter coefficients for

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a television channel filter?

A. No.

Q. As we talked about before in Exhibit 2005, Page 4, Silicon Labs stated that the key to TV broadcasting is sensitivity and selectivity.

Are we on -- correct that?

MR. AYERS: Objection; form.

(Discussion held off the written record.)

A. Now I'm ready for the question.

Q. (BY MR. FLEMING) Okay. Turning to Exhibit 2005, Page 4.

A. I'm there.

Q. Does Silicon Labs state that the key to TV broadcast reception is sensitivity and selectivity?

A. They do.

Q. Does Harris address these heightened requirements of sensitivity?

MR. AYERS: Objection; form.

Q. (BY MR. FLEMING) And selectivity?

A. Well, they -- yeah. It does talk about sensitivity. It talks about signal-to-noise ratio, I think. There is an expression on Page 6.

Q. Okay.

A. So, yes, it does talk about sensitivity.

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2 Q. Okay. So what is the signal-to-noise ratio
3 there?

4 A. It says it's $10 \cdot \log$ -- it says it's: Ten times
5 the logarithm of Bandwidth I over Bandwidth O, where
6 Bandwidth O is the output bandwidth and Bandwidth I is the
7 input bandwidth.

8 Q. And is that a signal-to-noise ratio suitable for
9 TV?

10 A. I don't know.

11 Q. Does Harris address higher linearity needed for
12 TV receivers?

13 A. No.

14 Q. Does Harris address high quality filtering in the
15 RF front-end?

16 MR. AYERS: Objection; form.

17 A. I don't know. I mean, I can look and see. I
18 don't know if -- sufficient. They do talk about filtering
19 in the front-end. They show it in their exemplary
20 diagram.

21 Q. (BY MR. FLEMING) Would that be suitable for TV
22 receivers?

23 A. Oh, that, I don't know.

24 MR. AYERS: We've been going an hour. Do
25 you want to take a break?

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2 MR. FLEMING: Yeah, let's talk a break.

3 (Break.)

4 Q. (BY MR. FLEMING) If we could go to Exhibit 1004,
5 the Thomson reference. And if we could, go to Figure 1.

6 A. All right. I'm on 1004.

7 Q. And if you look at the outputs Q and I.

8 A. I'm looking at them.

9 Q. Are those baseband signals coming out of those?

10 A. I believe they are.

11 Q. You believe they are?

12 A. Uh-huh.

13 Q. If we look at Column 3, Line 48, or even a little
14 bit higher up, Line 46, it talks about quadrature
15 demodulators. Could you read it up from there?

16 A. Yeah. I'll just start at the beginning of the
17 paragraph.

18 [READING]: For the reception of digitally
19 transmitted video signals, the analog pre-processing
20 blocks can be kept. In the digital part a quadrature
21 mixer and a special carrier regenerator have to be added
22 in order to demodulate QPSK modulated signals. The
23 carrier regenerator can be controlled by the digital QPSK
24 demodulator which is not depicted in Figure 1. The
25 quadrature demodulator is followed by low-pass filters to

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2 produce an in phase and a quadrature symbol pattern at the
3 output.

4 Keep going?

5 Q. So what is the purpose of the demodulator?

6 A. Well, it demodulates the signal that's the input
7 of -- coming off of the --

8 Q. But they're saying that this is not shown.
9 Right?

10 MR. AYERS: Objection; form.

11 A. It says -- it does say that. It says: In order
12 to demodulate the QPSK modulated signals.

13 It says: In the digital part, a quadrature mixer
14 and a carrier -- special carrier regenerator have to be
15 added in order to demodulate the QPSK modulated signal.

16 The carrier regenerator is Block 11.

17 Q. (BY MR. FLEMING) Is controlled by --

18 A. Demodulation is curbed at 12 and 13.

19 Q. Doesn't say that the carrier regenerator can be
20 controlled by the digital demodulator, which is not
21 depicted in Figure 1?

22 A. Yeah, it does. I think it's an error in the
23 patent. They probably -- they mean a decoder. It clearly
24 states that it demodulates, though, does it not? It says:
25 In order to demodulate the QPSK modulated signal.

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2 And it says that the I and Q are the symbols, and
3 that's the ordinary meaning of when you speak in terms of
4 QPSK in terms of signals -- symbols, sorry, and symbols
5 are a baseband.

6 Q. If you look at Lines 48 through the end of the
7 paragraph, if you could, read that.

8 A. [READING]: The digital quadrature demodulation
9 offers the --

10 Is that the place you want me to read?

11 Q. Uh-huh.

12 A. [READING]: -- advantage that it can be realized
13 without any phase in amplitude matching problems between
14 the I and Q channel. Furthermore, this architecture needs
15 only one A/D converter instead of two in the class with
16 QPSK modulator, or even three. It's also the digitizing
17 of the analog FM transmission that it's taking into
18 account.

19 Q. So are you still of the opinion that those
20 outputs are baseband?

21 A. Yeah, I think they are.

22 Q. So this is an error?

23 A. Yeah, it looks like the -- the words -- it
24 appears to be. Clearly the patent states: --

25 Let's just go back and read this: In the digital

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part, a quadrature mixer and a special carrier regenerator have to be added in order to demodulate the QPSK phase signal.

And then in the diagram, it shows the -- the carrier regenerator and the demodulator. It's showing those things. And so that must be what it's referring to.

Then it says the carrier generator is controlled by a demodulator.

And that's this input control that -- it's the QPSK demodulator control signal. And the picture carrier is the carrier on which the I and Q signals are modulated.

And so when you -- when you regenerate the carrier signal and mix it against the modulated I-Q, the result is the I and Q symbols.

Q. When you look on that "furthermore" sentence that's on -- that starts on Line 51 where it says "furthermore."

A. Uh-huh.

Q. Can you read that one more time.

A. [READING]: Furthermore this architecture needs only one A/D converter instead of two in the classical QPSK demodulator or even three if also the digitizing of the analog FM transmission is --

Q. So they're not using the classical demodulator?

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A. I think they're describing -- they're saying that a classical demodulator has two A/D converters. I don't know that they're talking classical in the theory, but I think they probably mean typical.

Q. If we could go to Page 30, Paragraph 52 of your declaration. And that would be Exhibit 1009.

A. I got it.

Q. IPR 2014-00728.

A. I'm there.

Q. Okay. If you could read the first sentence.

A. Okay. Paragraph 54, you said?

Q. 53.

A. Or 53. That "Thomson describes"?

Q. Uh-huh.

A. [READING]: Thomson describes a multi-standard tuner capable of receiving satellite broadcast terrestrial and cable transmissions.

Q. What does Thomson teach as far as RF frequency of satellite transmissions, and in particular what does it teach about converting the IF frequency signal? At what frequency are they talking about?

A. The output --

MR. AYERS: Objection; form.

Go ahead.

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A. I think it's covered in the gist of the invention where it says --

Q. (BY MR. FLEMING) I think it's Column 2, Lines 1 through 2 of the Thomson reference.

A. [READING]: To take advantage of the double-conversion tuner, the first IF frequency should be around 2 gigahertz.

Do you want me to keep reading?

Q. No.

So it's around 2 gigahertz that they're talking about?

A. That's exactly what they're talking about there.

Q. So then -- then Thomson then further teaches in 3 through 7 that it's downloaded to 27 megahertz. Am I correct?

A. That's incorrect. What it says is down converted but the bandwidth is 27 megahertz.

Q. Right.

A. You -- you with me on that?

Q. Uh-huh.

A. Okay.

Q. So what is the IF signal frequency of the -- of what they're teaching for terrestrial and cable transmission?

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2 A. The first IF is 2 gigahertz, as we've agreed.

3 Q. For a satellite.

4 What is it for terrestrial and cable?

5 A. I don't recall in reviewing this trying to
6 differentiate between the two. So just give me a
7 moment --

8 Q. Okay.

9 A. -- and let me see if I can't address that
10 question.

11 (Witness reviews document.)

12 A. Okay. Here's what we know. We know, because
13 it's stated, that you come off the satellite -- let me
14 just describe my understanding of what it is.

15 You're coming off the satellite at the satellite
16 frequencies. You do a first down convert to 2 gigahertz.
17 That 2 gigahertz goes into another down sample that is
18 tuned so that you can tune to channels. Those then --
19 that then takes you to the 140 megahertz IF signal that's
20 present at the input of the SAW filter. And then you have
21 the subsequent IF as a result of mixing with mixer
22 block 2.

23 Okay. So they -- once you get to the input of
24 the SAW filter, don't differentiate between -- because
25 they -- it's a multi-standard tuner.

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Q. (BY MR. FLEMING) So then my question, though, is can you explain that same scenario for terrestrial and cable, because they -- they have different frequencies. Do they not?

A. Yeah.

Q. They're RF frequencies are different?

A. This teaches the entire signal path. All I need to do for terrestrial and cable is just start at any -- their frequencies and down sample to the 140 megahertz, for example.

Q. So you would have to have a separate circuitry for that?

MR. AYERS: Objection; form.

A. Or a tuner -- a tuner is required as part of the --

Q. (BY MR. FLEMING) It would be a different circuitry for that tuner for terrestrial and cable for the tuner?

A. Because the starting frequencies are different.

Q. Okay. Thank you.

Let's turn to Page 39, Paragraph 66.

A. Of?

Q. Of your Exhibit 1009 IPR 2014-00728.

A. So that's Page 39?

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2 Q. Page 39, Paragraph 66.

3 If you look at the -- the last sentence which
4 goes on to the next page. If you could read that. It
5 begins with "it would have been obvious."

6 A. I got it.

7 [READING]: It would have been obvious to a
8 POSITA, as shown in admitted prior art Figure 1, because
9 television receivers are traditionally designed to
10 generate sound a user can hear and a video a user can see
11 on a television.

12 Q. So you meant using the demodulators 20 from the
13 '585 Figure 1 for the Thomson 2 demodulators, the FM
14 demodulator 9 for demodulating the IF signal when the
15 input RF signal is an analog TV format and a QPSK
16 demodulator 12 and 13 for demodulating the IF signal when
17 the input RF is a digital TV format? Is that what you
18 mean?

19 A. That was a lot.

20 Q. I know.

21 A. So let me try to absorb everything that
22 you just --

23 Are you saying that last paragraph in Thomson?

24 Q. Well, I am pointing to Figure 1 of Thomson. And
25 I'm trying to understand your basis for using separate

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demodulators. I'm sorry.

A. The basis for using separate demodulators is one is the digital format and the other is the analog format.

Q. Okay.

A. And so I have to use the FM demodulator. That is the analog format path in generating CVBS and the two sound outputs.

Q. So that's --

A. The I and Q are the -- are the other demodulators for the digital.

Q. Can you point to the actual element numbers of Figure 1?

A. Yeah, the -- Element 9 is the FM demodulator that's referenced in -- in Thomson as the analog. That's the analog path.

And then the I and Q demodulators are 12 and 13, working in concert with the carrier regeneration circuit generating LO signals -- or the signals.

Q. So there's parallel paths here. Correct?

A. Yeah, I -- I could see -- I mean, in the strictest interpretation of "parallel," you know, according to Euclid, no. But there's two paths that stem from the same point, yes.

Q. Could it be possible that the Element 8 is

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2 operating on separate circuits too to meet that function
3 in feeding those parallel paths?

4 A. I don't think that's what Thomson's describing
5 because he has an input that appears to be the standard
6 select control.

7 Q. But it could be possible?

8 MR. AYERS: Objection; form.

9 A. Could you construct a circuit with two parallel
10 paths? That's possible.

11 Q. (BY MR. FLEMING) So since the demodulators in
12 Thomson are located after the analog-to-digital converter
13 7, then FM demodulator 9 and QPSK demodulators 12 and 13
14 accept only digital signal as inputs?

15 A. If you'll allow me to kind of -- I had a thought
16 I kind of wanted to kind of explore here for a moment, and
17 then I'll address your question.

18 (Witness reviews document.)

19 A. Yeah, I mean, the -- to the previous question of
20 possibility, the spec specifies a bandpass filter 8, not
21 bandpass filters 8. Nothing would indicate in Thomson
22 that he implemented with -- with parallel filters. So
23 that -- and that was my read.

24 Now, to your next question, which I was kind of
25 not paying attention to, I was focusing --

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2 Q. (BY MR. FLEMING) To follow up, though, it could
3 be implemented that way?

4 A. One could implement it with two bandpass filters
5 in parallel.

6 Q. Okay. So back to my question. If you look at
7 Figure 1 of Thomson.

8 A. Okay.

9 Q. Since the demodulators in Thomson are located
10 after the A/D converter 7, right, then the FM demodulator
11 9 and the QPSK demodulators 12 and 13 accept only digital
12 signal as input. Right?

13 A. Yes, they operate on digital signals.

14 Q. Okay. So Figure 1 does not show an
15 analog-to-digital converter in that path?

16 A. Certainly in this path. It's the A/D 7.

17 Q. In Column 2, Lines 3 through 5 of the '585
18 patent. We're at Column 2, Lines 3 through 5. Can you
19 read me that -- for me.

20 A. [READING]: Channel filter 18 is typically a
21 discrete filter implemented as a SAW (surface acoustic
22 wave) filter.

23 Do you want me to keep going?

24 Q. No, that's fine. Thanks.

25 So a SAW filter, then, produces an analog output.

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Right?

A. It does.

Q. Then the '585 Figure 1 demodulators 20 accepts analog signal as inputs?

A. Where -- on your diagram? Exhibit 1001?

Q. Okay. Exhibit 1001 for IPR --

A. Okay. I just need 1001.

Q. Okay.

A. Where in the signal chain are you referring?

Q. If you look at Figure 1 --

A. Okay.

Q. -- of the '585 patent.

A. I'm good. I'm there.

Q. Demodulators 20 accept analog signals as input?

MR. AYERS: Objection; form.

Q. (BY MR. FLEMING) Is that correct?

A. Yeah, I think so. I mean -- because that was the prior art describing -- that they were describing. Yeah, that's what it is.

Q. So if we go to your declaration.

A. Page?

Q. Page 42, Paragraph 70.

A. Paragraph 7?

Q. Paragraph 70.

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2 A. Oh. 70. Oh. So that starts on Page 41, I
3 think.

4 Q. But it goes on to 42.

5 A. Correct.

6 Q. And where I want to point you to is where you
7 say -- the sentence beginning "if an analog demodulator."

8 A. Oh, okay. Yeah.

9 [READING]: If analog demodulators were used as
10 shown in the admitted prior art Figure 1, a POSITA would
11 have naturally thought to use a DAC to convert the digital
12 output of the signal processor to an analog format because
13 that is, by definition, the function of that device.

14 Q. But didn't you just previously say that the '585
15 Figure 1 demodulators 20 accept analog signals?

16 A. Block 20, you mean?

17 Q. Demodulators 20 in Figure 1?

18 A. Yeah, I think you're confused. But let me see in
19 which way.

20 (Witness reviews document.)

21 A. Yeah. All I'm saying there is if, as referenced
22 in Claim 3, Claim 3 says: The receiver of Claim 1,
23 further comprising: The digital-to-analog converter
24 coupled between said signal processor and a first one of
25 said plurality of demodulators, said digital-to-analog

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2 converter converting said digital output signals to
3 analog.

4 All it's saying is that if you wanted to convert
5 back to analog anywhere in the signal chain, it was a
6 straightforward process. That's what I'm saying there.

7 Okay. So then ask your question again. Are you
8 asking is this analog?

9 Q. (BY MR. FLEMING) Yes.

10 A. I think it is, yeah.

11 Q. So I think we're done.

12 A. Okay.

13 Q. So when we say "this," can you explain what is
14 analog?

15 A. (Witness indicating.)

16 Q. Pointing to Figure 1 of the '585 patent.

17 A. Okay. And you need it in words. Okay.

18 Q. Yeah.

19 A. The -- you know, you're focusing there so much.
20 Let me just make sure I haven't made a mistake.

21 (Witness reviews document.)

22 A. I correct that. It is digital. It says it in
23 the spec, Column 2, you know, second paragraph.

24 Q. (BY MR. FLEMING) But how does it be digital if
25 it's coming out of a SAW filter?

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2 A. Well, it's -- it's coming out of the -- it's
3 coming from the channel filter, and it says: Television
4 receiver 10 includes a channel filter 18 and a demodulator
5 20 for converting --

6 Q. I'm sorry. Where are you reading from?

7 A. At the top of Column 2, Line 1.

8 Q. Okay.

9 A. It says: Television receiver 10 --

10 Which is that Figure 1 illustration.

11 [READING] -- includes a channel filter 18 and a
12 demodulator 20 for converting the IF signal to video and
13 audio baseband signal.

14 It says: Channel filter 18 is typically a
15 discrete filter implemented as a SAW.

16 Okay. That certainly would indicate analog.

17 [READING]: The shape of the SAW filter is
18 designed specifically for the format (analog or digital
19 TV) and television standard (NTSC, PAL or SECAM) of the
20 television signals being received. Demodulator 20 is
21 typically a dedicated component and designed specifically
22 for a predetermined television signal format and a
23 predetermined television standard. When television
24 receiver 10 is a multi-standard receiver, a bank of
25 channel filters 18a to 18c is provided, each of the

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channel filters designed for specific format and standard. To support multi-standard reception, a bank of demodulators 20a to 20c is provided, each demodulator receiving filtered signals from a corresponding channel filter.

We're good so far?

[READING]: For analog television signal reception, the demodulator is a VIF/SIF module. The VIF-SIF module provides a video output called CVBS (composite video baseband signal) and audio outputs, such as MPX or A2. For digital television signal reception, the demodulator is a digital demodulator typically including a down converter, an analog-to-digital converter and other supporting circuitry to perform the demodulation.

Q. So for the analog leg, it's analog?

A. Analog. For the digital leg, it's digital. Right. So now that takes us somewhere.

Q. Yes. Going back to our questioning along the lines of anti-aliasing. Can an anti-aliasing always have to be a bandpass filter? Or can it be a low-pass filter?

A. I stated earlier in the day, it can be a low-pass filter as long as you are -- if you are not subsampling.

Q. As long as you're not subsampling?

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2 A. Yes.

3 Q. Can you explain that?

4 A. Yeah. As I explained earlier today, if you
5 sample a signal at twice its maximum frequency, then all
6 you need to guarantee is that the -- that the low-pass --
7 that the low-pass filter samples everything above that.
8 If you want to subsample at less than twice the absolute
9 frequency, you have to limit the bandwidth of that signal
10 to half of the sample rate. So those are the two, and
11 they're very -- and they are very important differences.

12 Q. And -- but the SAW filter has limited it to half
13 the bandwidth?

14 A. SAW filter doesn't limit it. Because after you
15 go through the first -- the second -- the mixer 2, you
16 have all those images. That's what you're trying to get
17 rid of with the bandpass filter.

18 Q. Okay.

19 A. The SAW filter is of no help in terms of
20 anti-aliasing.

21 Q. All right. Let's move to Page 41, Paragraph 68.

22 A. Okay. I'm there.

23 Q. Can you read the first sentence?

24 A. Yeah.

25 [READING]: As shown in Kerth, it would have been

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obvious to one of ordinary skill in the art to include a digital-to-analog converter coupled between the signal processor and a demodulator in a system where an analog signal would be desired or required, e.g. where a design choice is made for use as an analog demodulator requiring analog input.

Q. Okay. So turning to Thomson, Figure 1.

A. Okay.

Q. The analog-to-digital converter 7 --

A. Okay.

Q. -- is -- the demodulators are located after the analog-to-digital converter 7?

A. That's correct.

Q. And then the FM demodulator 9 and the QPSK demodulator 12 and 13 accept only digital signals as input?

A. That's correct.

Q. So if we look at Kerth, which is Exhibit 1011. On Column 4 --

Let me set some foundation first.

Do you recognize this reference, Kerth?

A. Yes, I do.

Q. And it -- can you read the patent number?

A. It's 6,804,497.

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2 Q. And if we turn to Column 4, Lines 19 to 21, can
3 you read those?

4 A. [READING]: This invention is in part --

5 [READING]: This invention in part contemplates
6 partitioning RF apparatus so as to provide highly
7 integrated, high-performance, low-cost and low form-factor
8 RF solutions.

9 Q. Okay. And if you could, go down to Column 4,
10 Lines 19 to 21.

11 A. I think I just read that.

12 Q. Oh, I'm sorry. Are there -- isn't it true that
13 the only examples that Kerth is providing is cellular
14 telephone?

15 A. I don't think Kerth mentions television. He
16 mentions -- yeah, I believe those are examples.

17 Q. So it's silent about television?

18 A. Yes.

19 Q. At the time of the '585 patent invention, the
20 maximum bandwidth of cellular telephones was around 0.02
21 megahertz. Do you know if that's correct?

22 A. No, I do not know.

23 Q. So nowhere in Kerth does it mention the
24 bandwidths that are in the Thomson range that we discussed
25 earlier?

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A. Most likely not.

Q. Turning to the claim chart that you have provided. Did you write these claim charts that are in your declaration?

A. The ones at the end?

Q. Yes.

A. No, those were drawn up in my direction. I wrote up the -- all my stuff is graphical, and then they're converted to this format. I like to draw things and --

Q. Oh. So you did the charts?

A. I did the original -- I found these references. I did all the work originally and then handed it over to help create the -- you know, flesh out the document.

Q. So you adopted them in total, then. Right?

MR. AYERS: Objection; form.

A. Yeah. I mean, I think I already signed --

Q. (BY MR. FLEMING) Is there anything that you disagree with now?

A. Well, let me read them just to make sure.

(Witness reviews document.)

A. I'm going have to -- unless you want to point me to some place that's problematic.

Q. (BY MR. FLEMING) I'm just asking you if you felt that you thought it was all correct?

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A. I'm pretty sure it's correct, but as we found, there are clerical errors that sneak in.

Q. Okay.

A. So it's possible there's a clerical error that I missed.

Q. Right. I want to turn to specifically the IPR 2014-00809 now. Again, if we go to Page 9 of your declaration of that IPR that's Exhibit 1009.

A. Okay. So what do you want me to do?

Q. Page 9, Paragraph 16. Again, you -- your first sentence, can you read --

A. You want me to read that?

Q. Just the first sentence of 16.

A. [READING]: For purposes of this section, I have been asked to assume that the preambles of the claims are not limitations on the claims.

Q. So is that correct, that --

A. Yeah. That's what I believe. That's what I've been -- you know, I'm not the attorney, but I've been told that that's the way I should interpret.

Q. So if we turn to Figure 1 again.

A. Of Thomson?

Q. Of Thomson.

Does -- Figure 1 shows receiving an IF-Sat input,

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not an RF input signal?

A. That's radio frequencies. That's 140 megahertz. Those are radio frequencies. So I would disagree.

Q. Oh. So you're saying now that Figure 1 shows RF input signals?

A. I'm saying that those signals, as the input to the SAW filter, are radio frequencies.

Q. So are you saying, then, that that first part is a tuner?

A. I didn't say that.

Q. Okay. So your -- let me ask you it in another way.

A. Well, I didn't know the antecedent of that. I mean --

Q. Let me ask it another way.

A. Okay.

Q. Is Figure 1 receiving radio frequencies directly from a terrestrial antenna?

MR. AYERS: Objection; form.

A. When you say "directly" --

Q. (BY MR. FLEMING) Without it being downloaded or --

A. Without any intervening --

Q. Yeah.

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A. No, clearly not.

Q. Okay. The same way for a cable transmission, it's not suggesting you plug the cable into the IF-Sat?

MR. AYERS: Objection; form.

A. Well, I -- you know, I did not -- to meet the claim limitations, I didn't try to understand every permutation of cable, satellite, et cetera. But I doubt that you would plug the cable directly in there.

Q. (BY MR. FLEMING) For Patent '792, Claim 1, are you of the opinion that Thomson clearly describes a receiver comprising a frequency conversion circuit?

A. Do I have that patent?

Q. Okay. That would be Exhibit 1001 of IPR 2014-00809.

(Witness reviews document.)

Q. (BY MR. FLEMING) I asked a question as for Patent No. '792, Claim 1, are you of the opinion that Thomson clearly describes a receiver comprising a frequency conversion circuit?

A. Yes.

Q. Okay. If we turn to Page 10, Paragraphs 17 and 18 of your declaration 1009 -- Exhibit 1009 for IPR 2014-00809.

A. I would be happy if you just said "809." If

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that's helpful.

Q. Yeah, maybe that will be better.

A. Page 10?

Q. Yeah. So if you look at page -- those two paragraphs --

A. 17 and 18?

Q. 17 and 18.

Are you not relying on Thomson's Figure 1 to show a tuner or a frequency conversion circuit?

A. Thomson shows a frequency conversion circuit in Mixer 2 at -- it shows -- there is many. And it describes a mixer conversion circuit to down sample to 2-gigahertz, and it also indicates the IF-Sat is 140 megahertz, indicating that it's implicit that there is yet another frequency conversion circuit. So there is multiple.

Q. But in Paragraph 18 you're relying on the outdoor satellite unit?

MR. AYERS: Objection; form.

(Witness reviews document.)

A. I just described the whole signal path.

Q. (BY MR. FLEMING) I'm just trying to understand your position on exactly what is covered by the -- what you view as Thomson teaching --

A. Yeah. I understand.

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(Witness reviews document.)

A. So this is -- we're doing '792 or '585 here?

Q. (BY MR. FLEMING) '792. Claim 1.

(Witness reviews document.)

A. I still stand by my position that Thomson teaches this.

Q. (BY MR. FLEMING) Yeah.

A. If that was the question --

Q. My question is, what elements are you relying on in Figure 1 for the frequency conversion circuit?

A. When I'm referring to frequency conversion circuit, as I mentioned, I'm referring to all of them. I'm not relying on any one. But all of them are involved in the process.

Q. When you say "all of them," what do you mean?

A. Well, there is one that gets you to 2-gigahertz from the satellite, and then there is the 2-gigahertz to 140 megahertz. And then there is a 140 megahertz to the 65 megahertz.

So the claim says -- and I say it here. It receives an RF signal from an outdoor satellite unit. RF signal is converted to 140 megahertz IF signal, and that is down converted by mixture stage 2.

I think the claim reads on it.

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2 Q. So -- just trying to clarify what elements you
3 view as reading on the frequency conversion --

4 A. It's --

5 Q. -- my understanding is it's the outdoor unit plus
6 the SAW filter plus the mixer plus the --

7 A. All I need is to convert an RF signal to an IF.
8 And so that IF, I'm happily to choose the Node 3 in
9 Thomson and the conversion occurs several times. There is
10 no limitation in the claim, I don't think, that precludes
11 that.

12 Q. So then it could only be Element 2?

13 MR. AYERS: Objection; form.

14 A. No, that's not what I said.

15 Q. (BY MR. FLEMING) So it's the outdoor unit plus
16 the SAW filter plus the mixer?

17 A. It is a frequency conversion circuit having an --
18 what you just described as a frequency conversion circuit
19 having an RF signal for converting the RF signal to an
20 intermediate frequency having an intermediate frequency,
21 IF.

22 Q. So it's those three elements?

23 A. Yeah.

24 Q. Okay. If you look at Patent '792, Column 5,
25 Lines 3 through 5. Can you read that for me?

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A. "In accordance"? Is that the sentence?

Q. Yes.

A. [READING]: In accordance with the present invention, frequency conversion circuit 110 can be signed -- designed to generate IF signals having an intermediate frequency of any values.

Is that far enough?

Q. Yeah.

So does that mean that a IF could be any value? Could it be just 6 megahertz, for instance?

MR. AYERS: Objection; form.

A. That's what it says. I agree that that's what it says.

Q. (BY MR. FLEMING) Okay. Are you familiar with the term "low-IF"?

A. Yes.

MR. AYERS: Objection; form.

Q. (BY MR. FLEMING) And what does -- is 6 megahertz considered low-IF?

MR. AYERS: And let me just sort of put on the record that, you know, this is starting to get into something -- I understand it's an issue in the district court litigation. It's clearly not something he opined on in his expert report. So I'm going to state very clear,

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2 I'm going to give you very little leeway on this line of
3 questioning, because I think this is clearly outside the
4 scope of his report.

5 MR. FLEMING: But it goes to the scope of
6 that claim, as far as what I'm trying to understand what
7 IF is. And it's important to understanding the validity
8 of the claim. So...

9 MR. AYERS: Just so you are aware --

10 MR. FLEMING: I'm sure there is overlap --

11 MR. AYERS: Just so you are aware. If we
12 need to go to on the board on this, I have no hesitation.
13 But I'll give you a little leeway on this.

14 A. I can't put a number to low-IF.

15 Q. (BY MR. FLEMING) Okay. Going again to the
16 signal processor for this Claim 1, again, are you relying
17 on the Harris modification to modify the Thomson reference
18 by substituting the Element 8 shown in Figure 1 with the
19 Harris HSP43220?

20 MR. AYERS: Objection; form.

21 (Witness reviews document.)

22 A. No, I'm not. And I state it in 22: Those
23 skilled in the art would consider the adaptive filter in
24 Thomson to be a "signal processor."

25 And I mention Patent No. 599,567, for example,

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2 shows a signal processor. And there are several others
3 that I mentioned. So there is multiple.

4 In addition, I would say that what's coming out
5 of A/D 7 is a digital signal and it goes into a filter as
6 stated in Thomson, which is a processor, it's a digital
7 signal processor. Standing alone Thomson anticipates the
8 digital signal processor --

9 Q. (BY MR. FLEMING) So --

10 A. Because that's all it could be.

11 Q. Turning to Page 15, Paragraph 27. Do you not
12 rely on Figure 4 in making the assertion that you're going
13 to use that?

14 A. Well, I thought you meant only -- where is it?

15 Q. Figure 4 of Harris.

16 A. Okay. Remind -- point me again to the page
17 number.

18 Q. I'm sorry.

19 A. Oh, yeah, on the Ground 1. Yeah. Okay. Yes,
20 that is correct. I thought it was that and only. I
21 mentioned these other examples, making the point that it
22 was very common to -- to digital signal processors.

23 But, yes, I do rely on -- on Harris as one of
24 the -- just as I did in the other disclosure -- or the
25 other declaration.

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2 But, again, I state for the record that it can be
3 nothing else. It's a digital filter. Processor.

4 Q. Okay. If we could move to Page 33 of your
5 declaration in the 809 IPR. Paragraph 49.

6 A. Okay.

7 Q. Where it begins with "digital signals 448," could
8 you read that sentence?

9 A. [READING]: Digital signals 448 and 451 of
10 Figure 4 (and 859 and 872, Figure 8) of Kerth provide
11 differential I and Q components capable of carrying video
12 and audio using a well-known quadrature demodulation
13 technique.

14 Q. Does -- and can you also look at Column 14 of
15 Kerth. I guess I should be more specific.

16 A. I'll find it.

17 Q. It is Exhibit 1011. I'm talking Column 14,
18 Line 58.

19 A. You'll have to slow down here.

20 Q. All right.

21 A. So now where do I go?

22 Q. Go to Column 14. And go to Line 58. And all the
23 way to 15 through -- Column 15, Line 7.

24 My question for you is, does Kerth disclose
25 processing video signals?

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A. No.

Q. So does Kerth disclose processing video signals anywhere?

A. Yeah, I didn't -- you know, I can't do a word search, but I'm pretty sure it doesn't.

Q. What are the examples of the application that Kerth provides? Is it only cellular telephone? You might look at Kerth, Column 2, Line 4; Column 2, Line 9; and Column 4, 26 through 32.

A. Column 2, Line 9.

Q. And Column 2, Line 4.

A. (Sotto voce.)

[READING]: High performance RF receivers or transceivers, for example, RF transceivers used are...form-factor RF transceivers for a high performance application, for example, in cellular handsets.

Is that what you want me to read?

Q. So it --

A. So he says --

Q. He's silent about television, then. Right?

A. Like I said a minute ago, I -- I didn't do a word search so I can't say definitively. But I doubt it.

Q. Does Kerth mention processing bandwidth in the Thomson range of 100 megahertz?

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MR. AYERS: Objection; form.

A. Let me look for his bandwidth.

Q. (BY MR. FLEMING) Yeah.

A. It might take me a while.

Q. If you look, Column 2, Line 6 -- I'm sorry. I'm off.

The -- the only mentions that I could find of...

(Witness reviews document.)

A. Yeah, I don't -- I got a lot of pages to go, so I can't say what I haven't found yet.

(Witness reviews document.)

A. So was the question bandwidth?

Q. (BY MR. FLEMING) Yes.

Maybe I'll ask you another way. Did you consider bandwidth when you were --

A. No. Kerth was just for the -- I believe the diax --

Q. Okay.

A. Differential outputs.

Q. Okay. We can move on.

A. Okay. It does mention RIF frequencies. But I haven't found bandwidth anywhere. Not to say that it would not be in here.

Q. Okay. If we look at Paragraph 52 of your

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declaration of IPR 728.

A. Okay. Paragraph 2?

Q. No, Paragraph 52.

A. Oh. 52.

MR. FLEMING: I'm sorry. Let me clear the record. I'm talking about his declaration in IPR 809.

Q. (BY MR. FLEMING) So I got you on the wrong track. Sorry.

A. That's all right.

Paragraph 52?

Q. Yeah.

A. Okay.

Q. Can you read the first sentence.

A. [READING]: Oku (Exhibit 1018) discloses a television receiver including a first digital-to-analog converter (e.g., Reference 21 in Figure 4) for receiving processed digital signals and converting to analog output signals. Oku further discloses a first driving circuit (e.g., Reference 22 in Figure 4) for driving analog output signals from DAC 21 to an output terminal.

Q. That -- that's good right there. We can stop right there.

A. All right.

Q. Turning to Exhibit 1018. I'll need to get you --

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and turning to Claim 13.

A. Of the '792?

Q. Of the -- of the '792.

Are you reading Oku's Driving Circuit 22, are you -- to read on the claim first driving circuit?

A. Okay.

(Witness reviews document.)

A. Yeah.

Q. (BY MR. FLEMING) Okay. So Driver 22, then, drives only Speaker 23. Is that right?

A. I'm looking --

Q. Oku, Figure 4.

A. Yeah, I'm looking -- well, I'm on Figure 6, but --

Q. I'm on Figure 4. So it might be helpful if you were on Figure 4.

A. It's good to be on the same...

Let me just make sure the language in the spec is consistent. But from the figure it appears to be a -- a single speaker, yes.

(Witness reviews document.)

A. Yeah, I believe it's a speaker.

Q. (BY MR. FLEMING) So what information, then, is provided to Element 23?

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2 A. Well, it would be a signal much like what you're
3 hearing out of my voice, audio.

4 Q. Okay. In paragraph -- if we look at the spec of
5 Oku. And if we look at 0049. If you could read the
6 sentence which says "when the decoder device."

7 A. Okay. I see that.

8 [READING]: When the decoder device
9 (corresponding to the Antenna 1 to the first and second
10 DACs 16 and 21) for the coded motion picture data and the
11 Monitor Driving Circuit 17, the Monitor 18, and the
12 Speaker Driving Circuit 22 and the Speaker 23 are provided
13 as separate devices, the conventional analog broadcasting
14 receiver can also be used as a monitor device by setting
15 the output of the decoder device for the coded motion
16 picture data to the same picture format as that for the
17 present-existing analog broadcast.

18 Q. So then Driver 22 shown in Figure 4 provides what
19 kind of information?

20 A. It's analog information.

21 Q. And it's only audio again. Right?

22 A. Yeah, it has to be audio to drive the speaker.

23 Q. Okay. No video. Correct?

24 A. No video driving the speaker. Correct.

25 Q. In Paragraph 53 of your declaration of 809. Can

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2 you read that sentence.

3 A. [READING]: Oku discloses a second driver circuit
4 (e.g., Reference 26, Figure 4) for driving the analog
5 output signals from DAC 21.

6 Q. Okay. So you're identifying Oku's Output
7 Circuit 26 shown in Figure 4 to read on the claim's second
8 driver reciting Claim 13. Is that correct?

9 A. Yes.

10 Q. Okay. If we go to Paragraph 55 -- and that's on
11 Page 37 of your declaration of 809. Beginning with "Oku
12 further discloses a third driving circuit," and read just
13 that one sentence.

14 A. Yeah.

15 [READING]: Oku further discloses a third driving
16 circuit (e.g., Reference 17 in Figure 4) for driving
17 analog output signals to a third output terminal.

18 Example 1018 at Paragraph 0048 and 0049.

19 Q. So you're identifying the Oku's Driving
20 Circuit 17 shown in Figure 4 to read on the third driving
21 circuit reciting Claim 13?

22 A. That's the way I'm reading it, yes.

23 Q. Then in Paragraph 56, Page 37. Referring to 13,
24 you identify the third driver as being Element 17 of Oku
25 again. Right?

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A. Uh-huh.

Q. Okay. So if we look at Figure 4. What is Driver 17 driving?

A. Driving the monitor.

Q. Is the Monitor 18 only video?

A. Ask that question again.

Q. Does -- so does Oku disclose that the Monitor 18 only receives video information?

A. Yeah, I believe so.

Q. Yeah. If we turn to that same paragraph of Oku, 0049, when you go to the third full sentence where it says "when the decoder device."

A. Yeah.

[READING]: When the decoder device (corresponding to Antenna 1 to the first and second DACs 16 and 21) for the coded motion picture data and the Monitor Driving Circuit 17, the Monitor 18 and the Speaker Driving Circuit 22 and the Speaker 23 are provided as separate devices.

Q. Okay. So, again, that supports that the Driving Circuit 17 only is sending video information, no audio?

A. That's correct.

Q. In Paragraph 58, referring to Claim 14. So we're on Paragraph 58, Page 38 of your declaration of the -09

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2 IPR. Can you read where it starts "Oku discloses when the
3 first driver circuit comprises..."

4 A. [READING]: Oku discloses wherein the first
5 driver circuit comprises a single-ended driver for driving
6 video baseband signals - example 1018 Figure 1 in
7 Paragraph 46, 48 - (graphics data is displayed on
8 Monitor 18 after passing through DAC 16 and Driving
9 Circuit 17).

10 Q. So you're identifying Oku's Driving Circuit 17,
11 as shown on Figure 4 as reading on the claim first driver
12 as reciting Claim 14?

13 (Witness reviews document.)

14 A. Yeah. Yes, I am.

15 Q. (BY MR. FLEMING) Okay. In Paragraph 56, Page 37
16 of your declaration, you identify the same Oku Driving
17 Circuit 17 shown in Figure 4 as reading on the third
18 driver.

19 A. Did I make a mistake?

20 (Witness reviews document.)

21 A. So what is it you're saying? Which driver --
22 Okay. In 58...

23 (Witness reviews document.)

24 A. Let me go back here and figure out the first,
25 second and third.

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(Witness reviews document.)

A. Okay. So the first -- the way I constructed this is the -- the first driving circuit is 22 and then we'll go back and look and see if the video/audio...

The second driver circuit is 26.

Third driving circuit is 17.

Okay. So that's -- I've broken down the three different ones.

So now, you had a specific question, I think, regarding one of the drivers.

Q. (BY MR. FLEMING) Yeah, when you went to Claim 14, you identified --

A. Okay. I see what you're saying. So let me see that...

(Witness reviews document.)

Q. (BY MR. FLEMING) You identified Driving Circuit 17 shown in 4 as reading on the first driver?

A. The first driving circuit...

(Witness reviews document.)

A. It appears to be I made a mistake.

Q. (BY MR. FLEMING) Okay. Are baseband audio signals different than decoded audio signals?

MR. AYERS: Objection; form.

A. Well, I -- in my construction, I interpreted

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baseband audio in light of -- are we talking about '792 or
'585?

Q. (BY MR. FLEMING) We're talking about '782.

A. '792 --

Q. '782.

A. Well, there's no '782.

Q. On the IPR.

A. Oh, I see.

Q. No, we were -- I'm sorry. I'm confusing you.
We're talking about IPR 809.

A. Okay. Which is --

MR. AYERS: '792.

A. '792. Okay.

Q. (BY MR. FLEMING) Yeah.

(Witness reviews document.)

A. Pardon me for taking the time. I'm looking for
something in here that I know is in here, but I normally
have the benefit of word search, so --

Q. (BY MR. FLEMING) But the real question is, is
baseband audio signals different than decoded audio
signals?

A. Oh, I understand -- I understand the question.
I'm not confused about that.

MR. AYERS: Objection; form.

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2 A. I'm -- I'm trying to -- in reading the claims on
3 Thomson, of course, taking the broadest reasonable
4 interpretation trying to understand everything about every
5 claim element, including the baseband. I think that's
6 kind of what you're getting to. And so in '792 of '585
7 there is some discussion.

8 (Witness reviews document.)

9 A. Okay. So in -- in the '792 patent on Page 9,
10 line --

11 Q. (BY MR. FLEMING) Are you saying column line?

12 A. Column -- I'm sorry. Column -- Page 9 -- I don't
13 need the page. Column 9, that's all we need to say.
14 Fortunately the formatting works.

15 So Column 9, Line 44 and following.

16 [READING]: Thus, Receiver 100 provides a video
17 baseband signal (CVBS) for analog television, an audio
18 baseband signal (sound IF).

19 So they -- I interpret from the spec of this
20 patent that sound IF is baseband.

21 And then to your question of, is it decoded?
22 Yes, it has to be decoded.

23 Q. So you're -- you're using the '792 to have a
24 special meaning for "baseband"?

25 A. No, I assume it's the common and ordinary

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meaning.

Q. Okay.

A. With --

Q. So does baseband, the common and ordinary meaning, require -- doesn't it require further decoding?

MR. AYERS: Objection; form.

A. If I read the claims on the '792 on earlier art, I have to read the claim elements. It's my understanding, at least, not as a patent attorney, but it formed that the claim elements have to be interpreted in light of the spec.

So when I see "baseband," the word "baseband" in the claim, if -- if there is any confusion in that term, since the patent writer can be its own lexicographer. I need to understand what the patent owner understands in terms of "baseband."

Q. (BY MR. FLEMING) So just to make clear, you're -- you're using broadest reasonable interpretation --

A. Yes.

Q. -- to interpret the term "baseband" to have a special meaning defined by the spec in Column 9, Lines 44 through 50?

MR. AYERS: Objection; form.

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A. I don't know that it's a special meaning. It's the meaning I interpreted.

Q. (BY MR. FLEMING) But it's different than the common meaning?

MR. AYERS: Objection; form.

A. Do we have a construction for baseband? We may have gone through it this morning.

(Witness reviews document.)

Q. (BY MR. FLEMING) Unless you have some sort of reference, there isn't. I'm just -- I'm asking you, that your definition, then, is based upon the meaning here on Column 9, lines --

A. What -- what I interpret from this -- these claims in the '792 patent, in -- in the context of sound in particular when it says "baseband," I interpret it just exactly the way Column 46 described it: Audio baseband (sound IF).

Q. And it doesn't require any further decoding based on that?

A. That is not --

MR. AYERS: Objection; form.

A. -- what I said. I said it did require decoding.

Q. (BY MR. FLEMING) It did require decoding?

A. Yes, yes. The signal --

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Q. So --

A. -- is probably a 38-kilohertz center frequency with sidebands and a --

Q. So then the baseband audio signal is different than the decoded audio signal?

MR. AYERS: Objection; form.

A. Yeah, it has to be decoded.

Q. (BY MR. FLEMING) Okay. Very good.

If you -- since you identified the third output terminal signal as being the signal outputted to the Speaker 23, then that audio signal must be decoded?

A. Yes, it would necessarily be. In fact, it shows an audio decoder there. Did I state to the contrary?

Q. What are you relying on as the decoder?

A. In Oku?

Q. Uh-huh.

A. Block 20.

Q. Okay. Let's go on. In Paragraph 53, Page 36 of your declaration for IPR 809.

A. Uh-huh. I'm there.

Q. You identified Element 26 from Oku as the second driving circuit. Is that right?

A. I just called those out a while ago.

Q. But you have go to the -- yeah. 53.

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Paragraph 53.

A. Okay. First Driving Circuit, 22. Second driver, 26. The third driver, 17.

I think I can keep that in my head.

Now, what's the question?

Q. I was just simply asking that on Paragraph 53, Page 36, you're identifying Element 26 of Oku as the second driver. That's all I asked.

A. Okay. Yeah. Right. Okay. I'm sorry. I wasn't sure where we were in that whole sequence.

Q. Okay. All right. And then if we could turn to Paragraph 61.

A. 51. 5-1?

Q. 61.

A. Oh. 6-1.

Q. Your -- your -- can you read for me the first sentence, 61.

A. Yeah.

[READING]: As discussed in Paragraphs 48 to 50 above, Kerth discloses first and second differential output terminals (e.g., Refs 448 and 451).

Q. So do -- do you mean that Kerth discloses the second driving circuit comprising a differential output driver circuit wherein the second output terminal

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2 comprises first and second differential output terminals?

3 A. Restate the question, please.

4 Q. Yes.

5 Do you mean that Kerth discloses the second
6 driving -- driver circuit comprising a differential output
7 driving circuit where the second output terminal comprises
8 a first and second differential output terminal?

9 A. Yeah, I'm saying -- I'd say that a little bit
10 different way. Kerth shows you how to get a differential
11 output. That's -- that's all I'm saying.

12 Q. So are you --

13 A. That's all I'm saying. I am not necessarily -- I
14 am certainly using Kerth to support a differential output.
15 I'm not --

16 [READING]: Wherein the second output terminal
17 comprises a first differential output.

18 And it could be the second output terminal. But
19 I'm simply showing Kerth to demonstrate the most
20 trivial --

21 Q. So --

22 A. -- of things of the -- that you can have a single
23 in an output or a differential output.

24 Q. Okay. So are you substituting Kerth's second
25 driver circuit in the Oku system?

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2 A. Let me bring up Kerth. I'm just trying to show
3 the differential outputs.

4 That's 1011, I think. Isn't it?

5 Q. Kerth?

6 A. Yeah.

7 Q. Yes.

8 (Discussion off the written record.)

9 (Witness reviews document.)

10 A. So the claim is saying: Wherein the second
11 output terminal comprises a first differential output
12 terminal and a second differential output terminal.

13 All I need is to show that Kerth, or anyone else
14 for that matter, provides differential outputs -- in fact,
15 it --

16 Q. (BY MR. FLEMING) So are you -- again, are you
17 substituting the Kerth's second driving circuit into the
18 Oku system?

19 A. It's actually DAC circuitry that's there. 448
20 and 451 are outputs of the DAC. I don't recall if Kerth
21 recites specifically a driver, although it may be
22 implicit, but I'm substituting that.

23 Q. Okay. If the recording device 27, Oku, then it
24 has to accept differential inputs since it's driven by a
25 differential driver?

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A. Okay.

(Witness reviews document.)

A. Yes. I mean, yes, if it's differential outputs, then you want differential inputs.

Q. (BY MR. FLEMING) Does Kerth -- does Oku --

A. Oku.

Q. -- Oku state that his recording device 27 accepts differential inputs?

A. I don't know. It's certainly possible since it's an analog and it's -- it's not atypical to provide differential input to the analog circuitry.

Let me look.

(Witness reviews document.)

A. I don't see -- no, I'm not at the end. I thought I was at the end.

Figure 4...

Yeah. Okay.

(Witness reviews document.)

A. There is no indication of differential. But it's possible.

Q. (BY MR. FLEMING) Okay. I'm going to move on. On Page 26 of your declaration for the 809, Paragraph 42 --

A. I'm there.

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2 Q. -- can you read the first line.

3 A. [READING]: A POSITA at the time of the patent
4 would have been motivated to reduce the tuner of Thomson
5 and Harris or Harris and TI App in a single monolithic IC
6 in order to save printed circuit board space and reduce
7 parasitic effects, as was well known at the time of this
8 invention.

9 Q. So the proposed combination of Thomson and Harris
10 would include the Thomson SAW filter shown in Figure 1?

11 A. Is that a question?

12 Q. Yeah. Is that true?

13 A. I thought you just stated that.

14 And to read, the SAW filter was in the signal
15 path, but it was not necessary that the filter be
16 implemented with a SAW technology. A POSITA would
17 understand that.

18 Q. So you're eliminating the SAW filter?

19 A. No, no, no. I'm just saying that you could
20 implement the function with a different technology.

21 Q. So that's not your proposed combination we've
22 been talking about?

23 A. No, the SAW filter was in the signal path, but
24 for integration --

25 Q. So for integration --

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2 A. Okay. I think I see what you're saying. Yeah.
3 Okay.

4 For integration, what I have to do -- it is the
5 proposed combination, but -- and it's a POSITA argument.
6 I could implement --

7 Q. So you're going to have to --

8 MR. AYERS: Can you let him finish his
9 answer?

10 MR. FLEMING: I'm sorry.

11 A. I would implement the SAW filter function with
12 on-chip filtering capability, GMC filters, LC. As
13 described, I think, in Gunter or Gomez, one of the
14 references we used.

15 So I'm just saying that you could implement the
16 filter function in a different technology integrated
17 on-chip with the other component. That's all I'm saying.
18 It's very simple.

19 Q. (BY MR. FLEMING) So your combination now is that
20 you're going to have to also modify that SAW filter to
21 make it a digital device?

22 A. No, I'm not. You have a signal path of which the
23 analog SAW filter is in that path. Imagine, if you will,
24 replacing that surface acoustic wave device with an LC
25 filter.

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2 Q. So you're having an additional modification to
3 the Thomson --

4 A. I'm saying a POSITA would understand --

5 Q. It's --

6 MR. AYERS: Let him finish his answer before
7 you pose a question.

8 A. A POSITA would understand that when he saw that,
9 he would say, you know what, I can't implement the SAW
10 filter on-chip, but what I can implement is an LC filter.

11 Q. (BY MR. FLEMING) So now we're having --

12 A. Nothing has changed in my position.

13 Q. But it wasn't clear on the record that you were
14 actually going to modify the SAW filter with an LC
15 circuit.

16 A. It wasn't necessary for the earlier reads.

17 Q. So you're saying that one of ordinary skill in
18 the art would realize that you would have to modify the
19 SAW filter to become an LC circuit now?

20 A. Yeah. In order to integrate -- one solution to
21 integrate would be to simply implement the -- I'm not
22 doing bait and switch here. It's just I'm saying if I
23 wanted to integrate it and I needed to solve that problem,
24 it was known in the art that you could do that with LC
25 filters.

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2 Q. So you would have to do this modification in
3 order to integrate?

4 A. In order to integrate, yes.

5 Q. You would have to eliminate the SAW filter?

6 A. You would have -- yes, you couldn't implement it
7 with surface acoustic wave technology. You'd have to
8 integrate with -- because you can't integrate SAW with
9 CMOS, for example.

10 Q. So your position is that -- or I should ask it as
11 a question.

12 Can you obtain the same filtering of the SAW
13 filter using an LC filter?

14 A. You can -- I believe that you can implement a
15 140 megahertz center frequency filter. I do not have the
16 strict performance requirements of that, but I believe
17 that -- the -- that it would be possible.

18 And let me clarify. I said one form is LC.
19 Maybe it's GMC. Maybe it's resonators. You know,
20 there's -- LC is one example.

21 Whether it could meet the specific requirements
22 in any specific situation, I've not investigated further.

23 Q. Does Gunter suggest ways in which you would
24 substitute a SAW filter so that you could use other
25 appropriate circuitry to create a monolithic integrated

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circuit?

A. Would it be fair to ask for the Gunter reference?

Q. Yeah, it would be very fair.

All right. So Gunter is Exhibit 1022.

A. I'm not going to waste our time. I'm pretty sure I do not recall Gunter mentioning a SAW filter. But maybe there is some way I can reserve my right to change my mind if I find it while you're talking.

Q. So you rely on Column 3, Lines 50 through 52?

(Witness reviews document.)

A. Yeah. Yeah, that's correct.

I think that I said Gunter a while ago with respect to the LC filter. I think it's probably Gomez. I don't think we need to go there.

Q. (BY MR. FLEMING) Turning to Paragraph 62 of your declaration in IPR 809. Paragraph 62, that's on Page 41.

A. I found it.

Q. Can you read the first sentence?

A. [READING]: Thomson discloses low-pass filtering of output signals using low-pass filters (Reference 14 and 15 for the Q/I and reference 10 for CVBS). (Exhibit 1004 in Figure 1, 2 -- Column 2, Line 37 through 44).

Q. So can you make clear the Thomson elements shown in Figure 1 that you're relying on to read on the low-pass

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2 filter recited on Claim 16?

3 A. Yeah, I can do that. I identified it in the
4 sentence, 14 and 15.

5 Q. Is it also Element 10?

6 A. Oh. For the CVBS, yes.

7 Q. If we went to Column 4, Lines 10 through 12 of
8 Exhibit 1004, which is Thomson, and if you could, read
9 Lines 10 through 12.

10 A. Column 4?

11 Q. Column 4.

12 A. That would be the claims?

13 Q. Yes.

14 A. Okay.

15 Q. Starting with "FM."

16 A. [READING]: FM demodulator (9) and QPSK
17 demodulator (12,13) both working and digital signal
18 processing technique.

19 Q. So referring to Figure 1, FM demodulator 9 is
20 connected directly to what element?

21 A. FM demodulator 9 is connected to the input to the
22 node that's the output of Block 8. And its output is
23 connected to Block 10 and then another block that doesn't
24 have a number, but it says "sound selection figures."

25 Q. Wouldn't it be fair, then, to say that Figure 1

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2 shows that Element 10 is a digital device and an analog
3 device?

4 MR. AYERS: Objection; form.

5 A. Well, I understand --

6 Okay. I formulated the thought, but let me --
7 restate your question now and make sure I haven't gone off
8 in the weeds.

9 Q. (BY MR. FLEMING) So would it be fair to say that
10 Figure 1 shows that Element 10 was a digital device and an
11 analog device?

12 MR. AYERS: Objection; form.

13 A. Well, I think that clearly my interpretation of
14 CVBS and SMOD 1 and 2 are analog signals. And I've
15 made -- and I'm certain that the input to the demodulator
16 is digital. So somewhere along that path there is a
17 conversion to analog. I don't -- I'm not sure that I can
18 say that that occurs in 10. It may well occur in 9. And
19 I would think Thomson gives that detail, but let me look.

20 (Witness reviews document.)

21 A. Yeah, I don't see -- they don't explain where in
22 the signal path. But certainly it has to go from digital
23 to analog. If that's the question you're asking, then I
24 agree with you.

25 Q. (BY MR. FLEMING) Okay. Can we go to

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2 Paragraph 66 of your declaration of the 809 IPR? And you
3 state that -- on the top of Page 44, can you read that
4 first full sentence.

5 A. [READING]: A POSITA would know that digital
6 satellite TV signals as (discussed in Thomson) would be
7 encoded using MPEG, and therefore would be motivated to
8 combine Thomson (or other references disclosing digital
9 TV).

10 Q. So when you -- and later, then, you're relying
11 on -- in Paragraph 67, you're relying on the -- when you
12 refer to the Cirrus Logic, are you referring to all of the
13 exhibits, Exhibit 1015? I'm sorry. When you're in
14 Paragraph 66, are you -- and when you're referring to
15 Cirrus Logic, are you referring to Exhibit 1015, 1016?

16 A. For Claim 9?

17 Q. Claim 8.

18 A. Okay. Sorry.

19 Q. I'm just trying to understand what Cirrus Logic
20 is. What is -- you have three exhibits. What are you
21 referring to?

22 A. Okay. All right. In the Cirrus Logic -- can I
23 have the exhibits?

24 Q. Okay. We're handing you Exhibit 1015,
25 Exhibit 1016, Exhibit 1017.

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A. And you're on Claim 8?

Q. Yes.

A. And you're asking me --

Q. Yeah. When you're referring to the Cirrus Logic, what are you referring to?

A. Well, the Cirrus Logic, I'm relying on the -- as stated in Paragraph 65 of decoding video and audio baseband signals. 4950 being -- pardon me -- CS4954 being the video chip, and the CS4223 being the audio chip.

Q. So in your declaration, you refer to CS92288 --

A. Yes.

Q. -- CODEC.

A. That's for the MPEG element, MPEG CODEC.

Q. So when I go to Exhibit 1015, are you not relying on Page 1, which shows the USB DVR-2.0 Reference Design? Is that what you're relying on?

A. Yes, that describes the -- well, in part, at least. I think the -- yeah, the 92288 takes care of the MPEG component of that.

And then the 4954 provides a video out.

And the 4223 provides the audio out.

Q. But the system shown there, USB DVR-2.0 Reference Design, can you read the first sentence in that paragraph on Page 1 of Exhibit 1015.

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2 A. Paragraph 1 of that subsection?

3 Q. Yes. It begins --

4 A. Well, the only paragraph in that subsection.

5 "The USB DVR-2.0"?

6 Q. Uh-huh.

7 A. Okay.

8 [READING]: Is a complete reference design that
9 makes it easy to capture, edit, view, and store audio,
10 video and television signals on Microsoft Windows-based
11 personal computers with USB ports. It can output MPEG
12 video to a computer display or a standard NTSC/PAL video
13 monitor, our CS92288 MPEG-2 audio/video CODEC is the heart
14 of the reference design.

15 Q. So are you going to substitute that entire
16 reference design, USB DVR-2.0 for your combination?

17 MR. AYERS: Objection; form.

18 A. For the --

19 Q. (BY MR. FLEMING) Claim 8.

20 A. For Claim 8, yeah.

21 So Claim 8 says: The television receiver of
22 Claim 7 further comprising a demodulator circuit for
23 demodulating the first output signal and the second output
24 signal according to the television signal format of the RF
25 signal, the demodulator circuit generating video and audio

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baseband signals corresponding to the format of the input RF signal, a decoder coupled to decode the video and audio baseband signals for providing video and audio display signals corresponding to the television format.

The decoder element is what I needed from this reference.

Q. The decoder element?

A. Well, I needed to do the -- decoding the video and audio baseband signals.

Q. So, again, are you using that entire block to be somehow --

A. No.

Q. -- modified to the Thomson reference?

A. No, I don't need the tuner in this reference.

Q. So you're just going to rip out these parts and somehow put it together with the Thomson reference?

A. The CS92288 --

MR. AYERS: Objection; form.

A. -- is a device. This is -- the reference design is made up of multiple chips, and that's one of the chips, and it has the decoder in it. And so that would teach you that -- that someone has implemented the decoder, and that's the argument that I make.

Q. (BY MR. FLEMING) But you are going to securely

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2 modify USB DVR-2.0's Reference Design to somehow obtain
3 the claim by modifying the Thomson reference?

4 A. So let me see exactly what I referenced. I mean,
5 I referenced this document, the CS92288. And from this
6 document, I needed the decoders, and I listed them there.

7 I don't need -- I don't need to sweep in
8 everything in that figure.

9 Q. But you are modifying that figure, then?

10 A. No, the figure is what it is. I can't change the
11 figure. But all I need are the elements that are useful
12 to me.

13 Q. So what are you going to pick and choose out of
14 that?

15 A. I stated it in my declaration.

16 MR. AYERS: Objection; form.

17 Q. (BY MR. FLEMING) I'm sorry. I didn't
18 understand. Can you tell me?

19 A. The 4954 chip provides the video output
20 signals --

21 Q. So we're going to take that out of that device?

22 A. Certainly.

23 Q. And what else are we going to --

24 A. This is a board. This isn't a device.

25 Q. So we're going to unplug this and somehow

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2 cruje (phonetic) it together with the Thomson reference?

3 A. No, what I'd do is I'd implement it, implement --
4 if I'm doing -- if I'm using the Thomson reference and the
5 other references I've cited to build the television
6 receiver in 2000, then I would look to this reference and
7 say, "Well, there's -- there's a way somebody's
8 implemented the video decoder" -- or video encoder, in
9 this case -- "so I can use that idea. There's -- at least
10 it gives me hope that somebody has done it successfully.
11 And so now I'll do it."

12 And for the audio, I look to the 4223 and
13 implement that.

14 And so it's not like I'm ripping it apart, but it
15 certainly disproves what I need in order to implement the
16 features described in Claim 8. As a POSITA, I think
17 that's not a leap, that's straightforward.

18 Q. Based upon just looking at the circuit numbers?

19 A. Those circuits were -- had data sheets available.
20 I think we have them as -- as -- as exhibits describing
21 them explicitly in block diagram form. All you would need
22 to do is implement them.

23 Q. Are they not being used for a different purpose
24 in a different system?

25 MR. AYERS: Objection; form.

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A. This is a TV receiver. Right? Isn't that what it says?

Q. (BY MR. FLEMING) No.

A. It's a video --

Q. It's a video. Can --

A. NTSC -- it's a tuner connected to an antenna. It's NTSC and PAL. All indications are it's a TV tuner.

Q. Used to capture and edit and view and store audio and video and television signals using the Microsoft Windows. Correct?

A. That's one thing it does. That's -- that's exactly what that sentence says.

Q. Okay. Can you tell me what some of these terms mean? Does CS4954, is that a digital video encoder or a decoder?

A. It's this circuit right here in this exhibit, which is Exhibit 1017.

Q. Is it an encoder or a decoder?

A. It has digital inputs and analog outputs.

Q. Is it an encoder or decoder?

A. It's described as an encoder. However, it's a misnomer in this period of time. Incidentally, this was in my product, or this is one of my circuits.

I always found it unusual that they called going

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2 from digital to analog as encoders, but that's what they
3 did. It's an odd choice of words, but you can certainly
4 understand the function simply by looking at the block
5 diagram. It takes digital and provides analog as does the
6 '792 patent, '585.

7 Q. Is the CS4954, does it accept input formats of
8 YcbCR or YUV signals?

9 MR. AYERS: Objection; form.

10 A. You can do either. It supports YCRcb (sic)
11 and/or YUV, as it says.

12 Q. (BY MR. FLEMING) So what is YcbCR format?

13 A. Well, Y is for -- is for the black and white
14 component of the signal. The CR and CB represents the red
15 and the blue component.

16 And the YUV is a similar but escapes me exactly
17 what -- the Y still is the -- the Y still captures the --
18 the black and white component, and the UV captures the
19 color components.

20 Q. Is it true that YcbCR and YUV are specific to
21 analog television formats?

22 (Witness reviews document.)

23 A. No, they're not specific to any format. They
24 could come from a camera that's an imager of CCD. It's
25 agnostic to television standards, formats.

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2 Q. (BY MR. FLEMING) Do they include audio?

3 A. No, they do not.

4 Q. I'm a little confused. The Thomson reference has
5 an I and Q that comprise both audio and video information.

6 A. Correct.

7 Q. So how is this going to work?

8 A. It -- it requires the 92288 to take the -- to
9 convert the symbols that -- from I and Q into the inputs
10 required for the encoder. It would just translate those
11 inputs.

12 Q. So when you say "simple design choice," in
13 that -- in your mind, that means that a person of ordinary
14 skill in the art would be able to tear apart this USB
15 DVR-2.2 and use these separate components, rearrange them,
16 and obtain the television receiver recited in Claim 8?

17 MR. AYERS: Objection; form.

18 A. It wouldn't be necessary. All you need, as a
19 designer, would be to see, number one, that it's been done
20 so it's breathable to try it.

21 Number two, you've got block diagrams that are
22 available to you. For the MPEG component, there are
23 standards. You go right to the standard. And so you
24 would implement the portions you would like. And so you
25 don't have to tear apart anything. What you do is you see

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2 what's been done, and you use that as a guide to implement
3 it yourself. You don't wonder. "I wonder if I can make a
4 video encoder. Here's the example."

5 Q. (BY MR. FLEMING) Do these two figures show a
6 MPEG input into CS92288?

7 A. They don't label it. I think it comes from the
8 NTSC/PAL decoder.

9 Q. Do the two figures show an audio output from the
10 CS92288?

11 A. It does by way of -- the output goes into the
12 audio CODEC and then to the output. There's a little
13 arrow there that points into the 4223, and then that comes
14 out to the output.

15 Q. Turning to your declaration in the 809 and
16 looking at the claim charts. Is there anything you would
17 like to change to that?

18 A. Okay. Let me look.

19 For which claim?

20 Q. I'm asking in total. Are you happy with both
21 claim charts?

22 A. I think so. I mean -- I found one clerical error
23 in here somewhere today. So, you know, it could have
24 happened again.

25 To the best of my knowledge, they're correct.

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2 Q. And you prepared the claim charts?

3 A. And, again, I -- I provided input via graphics
4 and verbal for these guys to -- Lee & Hayes to implement
5 these claim charts.

6 But I -- you know, this is -- I -- I -- I do
7 claim charts all -- graphically. I mean, I map all these
8 things, it's part of my job, as I support my other
9 clients. So, yeah. But I didn't build this table.

10 MR. FLEMING: I'm ready to break for the
11 day.

12 MR. AYERS: Okay.

13 (DEPOSITION ADJOURNED AT 5:01 P.M.)
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CORRECTION PAGE

WITNESS NAME: DOUGLAS R. HOLBERG, Ph.D. DATE: 12/17/2014

PAGE	LINE	CHANGE	REASON
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SIGNATURE PAGE

I, DOUGLAS R. HOLBERG, Ph.D., have read the foregoing deposition and hereby affix my signature that same is true and correct, except as noted on the correction page.

DOUGLAS R. HOLBERG, Ph.D.

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7	VS.	§	IPR 2014-00809
8		§	
9	CRESTA TECHNOLOGY	§	
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REPORTER'S CERTIFICATION
DEPOSITION OF DOUGLAS R. HOLBERG, Ph.D.
TAKEN DECEMBER 17, 2014

I, Tamara Chapman, Certified Shorthand Reporter in
and for the State of Texas, hereby certify to the
following:

That the witness, DOUGLAS R. HOLBERG, Ph.D., was duly
sworn by the officer and that the transcript of the oral
deposition is a true record of the testimony given by the
witness;

That the original deposition was delivered to
Mr. Peter Ayers;

That a copy of this certificate was served on all
parties and/or the witness shown herein on
12/30/2014.

1 I further certify that I am neither counsel for,
2 related to, nor employed by any of the parties in the
3 action in which this proceeding was taken, and further
4 that I am not financially or otherwise interested in the
5 outcome of the action.

6 Certified to by me this 19th day of December, 2014.
7
8
9

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