UNITED STATES INTERNATIONAL TRADE COMMISSION

WASHINGTON, D.C

_____x

In the Matter of :

CERTAIN AUDIO PROCESSING : Investigation No.

HARDWARE AND SOFTWARE AND : 337-TA-1026

PRODUCTS CONTAINING THE SAME :

_____x

Videotaped Deposition of SCOTT CLINTON DOUGLAS, Ph.D.

Washington, D.C.

Friday, June 16, 2017

9:09 a.m.

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Pages: 1 - 248

Reported By: Dawn M. Hart, RPR/RMR/CRR

Videotaped deposition of Scott Clinton Douglas, Ph.D., held at the law offices of:

COVINGTON & BURLING LLP
850 Tenth Street, Northwest
One City Center
Washington, DC 20001
(202) 662-6000

Pursuant to Notice, before Dawn M. Hart, RPR/RMR/CRR and Notary Public in and for the District of Columbia.

A P P E A R A N C E S

ON BEHALF OF THE COMPLAINANT AND THE WITNESS:

BRADLEY T. LENNIE, ESQUIRE
PEPPER HAMILTON LLP
Hamilton Square
600 Fourteenth Street, Northwest
Washington, DC 20005-2004
(202) 220-1200

ON BEHALF OF THE SAMSUNG RESPONDENTS:

PETER A. SWANSON, ESQUIRE
MATTHEW A. KUDZIN, ESQUIRE
ROBERT T. HASLAM, ESQUIRE
(Via teleconference.)
COVINGTON & BURLING LLP
850 Tenth Street, Northwest
One City Center
Washington, DC 20001
(202) 662-6000

A P P E A R A N C E S (Continued)

ON BEHALF OF THE RESPONDENT APPLE, INC.:

THOMAS A. BROUGHAN, III, ESQUIRE
STEVEN S. BAIK, ESQUIRE
SIDLEY AUSTIN LLP
1501 K Street, Northwest
Washington, DC 20005
(202) 736-8583

ON BEHALF OF THE U.S. ITC INVESTIGATIVE STAFF:

R. WHITNEY WINSTON, ESQUIRE
UNITED STATES INTERNATIONAL TRADE COMMISSION
Office of Unfair Import Investigations
500 E Street, Southwest
Washington, DC 20436
(202) 205-2221

ALSO PRESENT: Michael Rutigliano, Summer Intern
Elvis Centeno, Videographer

C O N T E N T S

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By Mr. Broughan 152

E X H I B I T S

(Exhibits are attached to the transcript.)

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1	P R O C E E D I N G S	09:09:56
2	THE VIDEOGRAPHER: Here begins Tape No. 1 in	08:36:30
3	the videotaped deposition of Dr. Scott Douglas in the	09:08:53
4	Matter of Certain Audio Processing Hardware and	09:08:56
5	Software, et al., Case No. 337-TA-1026.	09:09:00
6	Today's date is June 16, 2017. The time on	09:09:07
7	the video monitor is 9:09. The videographer today is	09:09:10
8	Elvis Centeno, representing Planet Depos. The video	09:09:13
9	deposition is taking place at 1501 K Street,	09:09:17
10	Northwest, Washington, DC.	09:09:21
11	Would counsel please identify themselves and	09:09:23
12	state whom they represent.	09:09:23
13	MR. SWANSON: Sure. Peter Swanson, from	09:09:26
14	Covington & Burling, on behalf of Samsung Electronics	09:09:30
15	Co. Limited and Samsung Electronics America, Inc.	09:09:34
16	Also with me from Covington is	09:09:37
17	Matthew Kudzin, and on the line is Robert Haslam, also	09:09:39
18	with Covington & Burling.	09:09:45
19	MR. BROUGHAN: Good morning. Tom Broughan,	09:09:49
20	Sidley Austin, on behalf of Respondent Apple. With me	09:09:50
21	is Steve Baik.	09:09:54
22	MR. WINSTON: Whitney Winston, from the	09:09:56

Commission Investigative Staff. 09:09:56

MR. LENNIE: And Brad Lennie, of 09:10:00

Pepper Hamilton, representing the witness and also 09:10:00

Andrea Electronics. 09:10:05

THE WITNESS: And I'm Scott Douglas. 09:10:07

THE VIDEOGRAPHER: Would the Reporter please 09:10:14

swear in the witness. 09:10:15

SCOTT CLINTON DOUGLAS, Ph.D. 09:10:15

being first duly sworn or affirmed to testify to 09:10:15

the truth, the whole truth, and nothing but the truth, 09:10:15

was examined and testified as follows: 09:10:15

EXAMINATION BY COUNSEL FOR THE RESPONDENT SAMSUNG 09:10:15

BY MR. SWANSON: 09:10:15

Q Good morning. 09:10:27

A Good morning. 09:10:29

Q Would you please state your name for the 09:10:30

record. 09:10:32

A Scott Clinton Douglas. 09:10:32

Q And are you employed, Mr. Douglas? 09:10:34

A I am employed, yes. 09:10:37

Q Where are you employed? 09:10:38

A I am a professor in the Department of 09:10:41

Electrical Engineering at Southern Methodist University in Dallas, Texas. 09:10:44 09:10:46

Q And you've been retained by Andrea Electronics in this case as an expert witness? 09:10:50 09:10:52

A Yes, I have. 09:10:54

Q And you've been retained to provide opinions on the issues of invalidity; is that right? 09:10:55 09:10:57

A That's one of the issues I've been retained on, yes. 09:11:03 09:11:06

Q Have you been deposed before? 09:11:08

A Yes, I have. 09:11:09

Q How many times? 09:11:10

A I believe three other times. 09:11:15

Q Okay. Do you understand the process for a deposition, the ground rules? 09:11:17 09:11:20

A I believe I do, yes. 09:11:24

Q Okay. Just to briefly summarize, if you don't understand one of my questions, then please ask for clarification. If you need a break, please ask for it. And please remember to give verbal answers. 09:11:25 09:11:29 09:11:32 09:11:37

A Okay. I understand. 09:11:42

Q Okay. 09:11:44

(Exhibit 1 was marked for identification and is attached to the transcript.) 09:12:12 09:12:12

Q Okay. I just handed you what's been marked Exhibit 1. This is a copy of U.S. Patent No. 6,363,345. 09:12:40 09:12:42 09:12:48

Have you seen this patent before? 09:12:53

A Yes, I have. 09:12:55

Q Are you familiar with this patent? 09:12:56

A I am. 09:12:58

Q Okay. And you've offered opinions on this patent in this case? 09:12:59 09:13:01

A Yes, I have. 09:13:02

Q What's the invention described in the '345 patent? 09:13:06 09:13:10

MR. LENNIE: Objection. Form. 09:13:12

A Can you clarify your question? 09:13:16

Q Do you believe -- let me back up. 09:13:19

Does -- the '345 patent relates to the area of noise suppression? 09:13:21 09:13:26

MR. LENNIE: Objection. 09:13:28

A '345 is a system, method and apparatus for canceling noise. 09:13:29 09:13:38

Q Okay. Does it fall within the field -- are you familiar with the field of noise suppression and noise cancellation? 09:13:39 09:13:42 09:13:44

A I am familiar with the field of noise suppression. 09:13:45 09:13:48

Q Okay. Do you consider yourself an expert in that field? 09:13:48 09:13:50

A I have experience and understanding in the field of noise suppression. 09:13:52 09:13:54

Q How -- how much experience? How long have you been working in the field of noise suppression? 09:14:00 09:14:01

A I've been a professor for over 25 years at two different institutions, and I've done work on various different aspects of signal processing, things related to adaptive filters and active noise control and aspects that basically relate to noise suppression. 09:14:08 09:14:12 09:14:15 09:14:18 09:14:22 09:14:25

Q Okay. And you've been doing that you said for over 25 years? 09:14:26 09:14:28

A Yes. 09:14:30

Q So the '345 patent relates -- falls within the field of noise suppression and noise cancellation? 09:14:32 09:14:36

MR. LENNIE: Objection. Form. 09:14:39

A The '345 patent is a system, method and 09:14:40

apparatus for canceling noise. It's a technology 09:14:50

that's designed to process signals to make them 09:14:53

better. 09:14:58

Q Uh-huh. And "make them better" meaning to 09:14:59

try to suppress noise or to cancel noise? 09:15:02

A The technology within '345 can be used to 09:15:11

cancel noise. 09:15:14

Q Does the '345 patent also relate to spectral 09:15:16

subtraction? 09:15:20

MR. LENNIE: Objection. Form. 09:15:22

A (Reviewing.) 09:15:28

It is a spectral subtraction technique and 09:15:28

it's a method to further reduce the noise. 09:15:42

Q Do you see -- let me direct you to column 1, 09:15:50

lines 19 through 21, of the patent. 09:15:56

A Uh-huh. 09:15:59

Q Do you see that? 09:16:00

A Yes. 09:16:00

Q It says, "The present invention relates to 09:16:01

noise cancellation and reduction and, more 09:16:02

specifically, to noise cancellation and reduction using spectral subtraction"? 09:16:05 09:16:08

A Yes. 09:16:10

Q Do you agree with that? 09:16:11

A I see that it says that, yes. 09:16:12

Q Do you agree that the present invention relates to noise cancellation/reduction? 09:16:14 09:16:16

A Yes. 09:16:18

MR. LENNIE: Objection. Form. 09:16:19

Q Do you agree that the present invention of the '345 patent relates more specifically to noise cancellation/reduction using spectral subtraction? 09:16:19 09:16:20 09:16:22

MR. LENNIE: Objection. Form. 09:16:25

A The technology within the '345 patent can be used for noise reduction. 09:16:38 09:16:41

Q And that technology is generally known as spectral subtraction? 09:16:46 09:16:51

MR. LENNIE: Objection. Form. 09:16:53

Q Or falls within the field known as spectral subtraction? 09:16:56 09:16:58

MR. LENNIE: Same objection. 09:16:59

A The technology is designed to remove the 09:17:04

noise from signals and it relates to the noise/cancellation reduction. 09:17:06 09:17:13

Q And it does so by using spectral subtraction? 09:17:15 09:17:18

A It uses techniques that are related to the methods within spectral subtraction. 09:17:28 09:17:30

Q Related to the method of spectral subtraction. Are those techniques considered spectral subtraction? 09:17:34 09:17:36 09:17:42

MR. LENNIE: Objection. 09:17:43

Q The techniques of the '345 patent? 09:17:44

MR. LENNIE: Objection. Form. 09:17:46

A The techniques described in the '345 patent are essentially about the spectral subtraction technique within the '345 and it uses methods that are -- that are common in spectral subtraction. 09:18:14 09:18:16 09:18:20 09:18:25

Q All right. What is spectral subtraction? 09:18:28

A Can you give me a little more context? 09:18:38

Q Do you have an understanding of the idea behind spectral subtraction? 09:18:40 09:18:42

A Yes, I do. 09:18:44

Q All right. What is that understanding? 09:18:45

A The goal is a technique to estimate noise and to be able to process the resulting signal to try to remove that noise. 09:18:48 09:18:53 09:18:56

Q That idea that you just described, that idea was known as of the time of the '345 patent -- the filing of the '345 patent; is that right? 09:19:01 09:19:05 09:19:09

MR. LENNIE: Objection. Objection. Form. 09:19:13

A Techniques in spectral subtraction have been described. The '345 patent is a system, method and apparatus for canceling noise. 09:19:18 09:19:21 09:19:26

Q But what you just described as the concept of spectral subtraction, that was already known as of February 1999, right? 09:19:28 09:19:30 09:19:34

A There are methods and procedures and techniques that people have been used -- that people have used to apply to remove noise from signals prior to this. 09:19:45 09:19:47 09:19:49 09:19:52

Q All right. Techniques to estimate noise and to remove that noise from signals, right? 09:19:56 09:19:58

A Yes. 09:20:02

Q Okay. Let me direct you to column 1, line 64, the sentence beginning at line 64. 09:20:07 09:20:17

This method described in detail in suppression of acoustic noise in speech using spectral subtraction, and then there is -- 09:20:26 09:20:28 09:20:32

A Just -- just a moment. 09:20:34

Q Yep. 09:20:36

A I want to make sure I -- 09:20:36

Q Sorry, column 1, line -- the sentence beginning at line 64. 09:20:37 09:20:40

A Oh, 64. Thank you. Uh-huh. 09:20:42

Q Do you see that sentence? 09:20:44

A I do. 09:20:45

Q Okay. And that sentence refers to a paper titled "Acoustic Noise in Speech Using Spectral Subtraction." 09:20:46 09:20:50 09:20:53

Do you see that? 09:20:53

A Yes. 09:20:55

Q And that paper is by Steven Boll? 09:20:55

A Yes. 09:20:58

Q Do you see that? 09:20:59

That paper -- that paper relates to the field of spectral subtraction, right? 09:21:01 09:21:07

A Yes. 09:21:09

Q That was a well-known publication as of 1999? 09:21:11 09:21:14

A Yes. 09:21:21

Q A person of skill in the art as of 1999 would have been familiar with Boll's paper? 09:21:22 09:21:25

A A person working in signal processing in the field of noise suppression would be aware of that paper. 09:21:31 09:21:35 09:21:37

Q What was significant about the Boll paper? 09:21:38

MR. LENNIE: Objection. Form. 09:21:42

A Can you give me some context in the -- in your question? It's not obvious what it is that you're asking. 09:21:52 09:21:55 09:21:57

Q Well, you said it was -- you agree it was a well-known publication as of 1999. Why -- why was it so well known in the field? 09:21:58 09:22:00 09:22:03

MR. LENNIE: Objection. Form. 09:22:05

A It was a relatively early authored paper in the field. It described techniques for digitally processing signals to reduce noise. 09:22:48 09:22:51 09:22:56

Q Those techniques were spectral subtraction techniques? 09:23:00 09:23:03

A He used the term "spectral subtraction" to describe them. The techniques were oriented towards removing noise. 09:23:11 09:23:13 09:23:18

Q And to noise estimation as well? 09:23:22

A He used methods of noise estimation within his technique. 09:23:28 09:23:31

Q Is musical noise a problem with spectral subtraction? 09:23:34 09:23:36

MR. LENNIE: Objection. Form. 09:23:37

A What do you mean by "musical noise"? 09:23:45

Q Do you have an understanding of that term? 09:23:48

A It's a term that can have different meaning in different contexts. 09:24:18 09:24:21

Q Does it have a meaning in the context of spectral subtraction? 09:24:23 09:24:25

MR. LENNIE: Objection. Form. 09:24:26

A It is not a precise term as I'm aware of it. It's describing more of an effect of something that someone might hear when -- when using a noise reduction system. 09:25:03 09:25:07 09:25:10 09:25:13

Q What is that effect? 09:25:16

A As I've understood others who've considered 09:25:35

it, it's the effect of hearing sounds that basically sound like their tones in nature. 09:25:39 09:25:45

Q And that effect, those -- those tones, are -- are they caused by spectral subtraction? 09:25:52 09:25:54

MR. LENNIE: Objection. Form. 09:26:00

A They can be caused by many things, I think. It's not obvious that they're caused by spectral subtraction. 09:26:11 09:26:14 09:26:17

Q But is that one of the things that can cause musical noise? 09:26:19 09:26:21

MR. LENNIE: Objection. Form. 09:26:24

A I -- again, as I heard about it in different contexts, it's caused by the operation of the system upon a signal that goes through it. 09:26:25 09:27:04 09:27:08

MR. SWANSON: Please mark this as Exhibit 2. 09:27:14

(Exhibit 2 was marked for identification and is attached to the transcript.) 09:27:15 09:27:15

Q Are you familiar with this document? 09:27:38

A I am. 09:27:40

Q What is this? 09:27:41

A This is a paper on a spatio-temporal power method for time-domain multi-channel speech 09:27:44 09:27:47

enhancement. 09:27:51

Q Okay. Are you one of the authors on the paper? 09:27:52 09:27:54

A I am. 09:27:55

Q Do you see under -- on the first page under the heading Introduction the first sentence reads, "Spectral subtraction is one of the most popular speech enhancement techniques because of its simplicity and relative low computational complexity"? 09:27:56 09:28:00 09:28:06 09:28:08 09:28:11

A I do. 09:28:15

Q Do you agree with that? 09:28:16

A I do. 09:28:19

Q And the next sentence says, "This technique performs well in high signal-to-noise-ratio environments but tends to create a noticeable tonal noise, more commonly known as the musical noise in low SNR and non-stationary noise conditions." 09:28:21 09:28:24 09:28:26 09:28:29 09:28:33

Do you see that? 09:28:36

A I do. 09:28:37

Q Do you agree with that? 09:28:38

A It can create a noticeable tonal noise, yes. 09:28:41

Q And the next sentence says, "This drives 09:28:45

algorithm developers to be very conservative in noise suppression and as a result the technique under-performs in all noise scenarios." 09:28:47 09:28:51 09:28:52

Do you see that? 09:28:55

A I do see that. 09:28:56

Q Do you agree with that statement? 09:28:57

A It's a guidance in terms of how the technique tends to be used and how the performance may -- may be in certain situations. 09:29:11 09:29:13 09:29:18

Q And because of how that performance may be in certain situations, algorithm developers tend to be conservative in noise suppression? Is that what this sentence is saying? 09:29:24 09:29:27 09:29:32 09:29:36

MR. LENNIE: Objection. Form. 09:29:37

A It's saying about algorithm developers and their design processes have to be careful about selecting parameters when designing such systems. 09:29:48 09:29:52 09:29:56

Q Uh-huh. And you agree that they tend to be conservative because of the issue of musical noise? 09:29:58 09:30:02

A They tend to carefully design such systems to mitigate any such effects that might occur. 09:30:12 09:30:16

Q And they do so by being conservative, that's 09:30:20

what you wrote here, right? 09:30:23

MR. LENNIE: Objection. Form. 09:30:25

A Designers of systems have to be careful 09:30:59
about how they use such systems when they apply them 09:31:01
in particular situations. 09:31:04

Q Okay. I don't think that answered my 09:31:09
question. 09:31:11

A Could you repeat your question? 09:31:12

Q Yes. You wrote here in this paper that the 09:31:13
issue of musical noise drives algorithm developers to 09:31:20
be very conservative in noise suppression. 09:31:23

Do you agree with that? 09:31:28

A I agree that algorithm developers have to 09:31:34
carefully design their systems to mitigate effects 09:31:37
that might occur as the result of the design. 09:31:40

Q Okay. I get that as a general principle. 09:31:45
I'm asking about the specific statement you wrote 09:31:47
here, which is you're talking about spectral 09:31:50
subtraction, you said one of the problems with 09:31:53
spectral subtraction was musical noise and you said, 09:31:55
quote, this drives algorithm developers to be very 09:31:57
conservative in noise suppression. 09:32:00

Do you agree with the sentence that you wrote in this paper or not? 09:32:02 09:32:04

MR. LENNIE: Objection. Form. 09:32:06

A What is important about the meaning of this sentence is that one must consider aspects in the design of such systems when implementing them to mitigate any ill effects that can result from that implementation. 09:32:23 09:32:27 09:32:31 09:32:34 09:32:37

Q Okay. I'm not asking what's important about the meaning of the sentence; I'm asking whether the sentence is accurate as you wrote it or not. 09:32:42 09:32:45 09:32:47

Can you please give me a yes or no ques- -- answer to that? 09:32:52 09:32:53

MR. LENNIE: Objection. Form. 09:32:54

A In order to make sure that the meaning of what's here is clear, I'm providing clarification. 09:32:58 09:33:01

When algorithm developers are implementing systems, one has to be careful about how one uses the implementation in order to mitigate any ill effects. 09:33:09 09:33:12 09:33:16

Q Uh-huh. And in the case of spectral subtraction and the problem of musical noise that results from spectral subtraction, that is mitigated 09:33:20 09:33:24 09:33:27

by algorithm developers being conservative in how they do noise suppression; is that right? 09:33:33 09:33:39

MR. LENNIE: Objection. Form. 09:33:41

A There are many ways to mitigate it. 09:33:42

Q Uh-huh. And one way to mitigate it is to be conservative in how you do your noise suppression? 09:33:45 09:33:48

A I mean, there are methods for addressing musical noise, so one can apply methods to be able to address it as well. 09:33:53 09:33:58 09:34:02

Q And is one of those methods to be conservative in how you do noise suppression? 09:34:03 09:34:04

MR. LENNIE: Objection. Form. 09:34:07

A Again, this sentence is really about how one, when designing systems, has to consider the potential effects of the implementation of that system and any problems that might arise. 09:34:10 09:34:18 09:34:22 09:34:25

Q Uh-huh. You said there are many ways to mitigate musical noise; is that right? 09:34:29 09:34:30

A There are -- there are methods that have been proposed, yes. 09:34:33 09:34:35

Q And what are the different methods? 09:34:36

A (Reviewing.) 09:34:53

Sitting here today I don't have the approaches sitting in front of me. I can't give you a list of all the different methods. 09:34:53 09:36:01 09:36:03

Q Uh-huh. And sitting here today you're not able to say whether musical noise drives algorithm developers to be very conservative in noise suppression? 09:36:05 09:36:08 09:36:13 09:36:15

MR. LENNIE: Objection. Form. 09:36:16

A As I've explained, those who are implementing systems for reducing noise have to take into account the effects that such systems might have and mitigate any issues associated with them. 09:36:22 09:36:25 09:36:30 09:36:33

Q Uh-huh. But sitting here right now you can't say whether one way developers address the problem of musical noise is to be conservative? 09:36:36 09:36:39 09:36:43

MR. LENNIE: Objection. 09:36:47

Q In noise suppression? 09:36:48

A I -- 09:36:49

MR. LENNIE: Objection. Form. 09:36:49

A Again, it -- it comes down to the implementation of the overall system. 09:36:50 09:36:54

Q Some developers might do that, though, for 09:36:57

some systems? 09:37:01

MR. LENNIE: Objection. Form. 09:37:02

A Again, developers, when they're designing systems, have to consider the overall effects of that implementation. 09:37:13 09:37:20 09:37:23

Q So you can't say, then, sitting here right now whether that's -- that's one way a developer might address the problem of musical noise? 09:37:24 09:37:27 09:37:30

MR. LENNIE: Objection. Form. 09:37:33

A Again, developers who are implementing systems have to consider those ill effects. 09:37:45 09:37:51

Q Right. And I'm just asking if you're able to say whether this is one possible way, not the only way, just one possible way, of addressing the effect of musical noise? 09:37:55 09:37:59 09:38:02 09:38:04

MR. LENNIE: Objection. Form. 09:38:09

A The techniques that people use to address these ill effects can -- can vary. 09:38:15 09:38:18

Q Okay. If you turn back to the '345 patent, Exhibit 1. 09:38:23 09:38:41

A Uh-huh. 09:38:42

Q And let's look at Figure 1. 09:38:44

A (Complying.) 09:38:58
Q Figure 1 is a flow diagram; is that right? 09:39:06
A It's a system that has input samples and output samples. 09:39:15 09:39:17
Q Okay. And it's captioned "Spectral Subtraction System"? 09:39:19 09:39:22
A Yes. 09:39:24
Q Okay. The first block, 104, of Figure 1 is -- says "Collect Input Data." 09:39:25 09:39:33
Do you see that? 09:39:37
A Yes. 09:39:38
Q Do you agree that collecting input data was known in the art as of the time of the '345 patent? 09:39:40 09:39:44
A Yes. 09:39:54
Q The next block, 106, says "Combine 256 New Point with 256 History." 09:39:55 09:40:01
Do you see that? 09:40:03
A Yes. 09:40:04
Q Is that describing the process of creating a frame? 09:40:05 09:40:07
MR. LENNIE: Objection. Form. 09:40:10
A (Reviewing.) 09:40:20

Block 104 is a temporary buffer that stores input samples, and it stores 256 points, and block 106 is a combiner that takes the new 256 points and provides -- combines with -- those with the previous 256 points to provide 512 input points. 09:41:03 09:41:08 09:41:15 09:41:20 09:41:24

Q Okay. Was block 106 known in the art? 09:41:28

MR. LENNIE: Objection. Form. 09:41:32

A I mean, systems that collect values are ones that are known that -- I mean, they're part of systems that people would have designed. 09:41:37 09:41:43 09:41:46

Q Uh-huh. Okay. So prior art systems would have done step 106? 09:41:49 09:41:54

A What prior art systems are you talking about? 09:42:00 09:42:01

Q Just the prior art in general, as of the time of -- as of February 1999. 09:42:02 09:42:05

A Prior -- prior art in what context? 09:42:09

Q Prior art -- things predating the '345 patent. 09:42:12 09:42:14

A In all contexts? 09:42:16

Q At least in some contexts. 09:42:19

A Okay, what contexts are those? 09:42:20

Q Any contexts. 09:42:23

A But that's -- that's all contexts. I mean, I -- I'm -- well, I'm trying to figure out what it is that you're -- that you're trying to get me to -- to answer. 09:42:24 09:42:27 09:42:31 09:42:32

Q In prior art spectral subtraction systems. So Figure 1 is about a spectral subtraction system, right? 09:42:33 09:42:35 09:42:39

A Yes. 09:42:40

Q Okay. Did prior art spectral subtraction systems perform the step 106? 09:42:40 09:42:42

A So systems for processing signals would have collected points. The choice of the number of points would depend upon the application. 09:42:48 09:42:51 09:42:54

Q Okay. Step 108 says "Multiply By Hanning Window"? 09:42:56 09:43:04

A Yes. 09:43:08

Q Was that step known in the art? 09:43:10

MR. LENNIE: Objection. Form. 09:43:15

A (Reviewing.) 09:43:23

108 is a multiplier that multiplies the input points with a shading window. Shading window 09:44:22 09:44:25

can be Hanning or it could be other types of windows. 09:44:30

Q But shading using Hanning windows or other types of windows was known in the art as of 1999? 09:44:39 09:44:43

A The purpose of this block is to smooth transients between two process blocks and to reduce side loads. 09:45:08 09:45:14 09:45:18

Q I don't think that answers my question. 09:45:24

A The method for doing this would be something that someone would be aware of, yes. 09:45:26 09:45:29

Q Okay. As of February 1999? 09:45:32

A This particular isolated block, yes. 09:45:35

Q Okay. The next block, 110, takes the output of the Hanning window and applies a 512-point FFT; is that right? 09:45:38 09:45:45 09:45:52

A Yes. 09:45:52

Q Was step 110 an FFT? Was that known in the art? 09:45:54 09:45:59

A An FFT, Fast Fourier Transform processor, which is what the block 110 is, is something that was used in various systems. 09:46:16 09:46:16 09:46:22

Q Prior to the '345 patent? 09:46:27

A It was used in various systems for different 09:46:29

applications, yes. 09:46:31

Q And the next block, block 112, that's labeled "Noise Processing"? 09:46:37 09:46:43

A Uh-huh. 09:46:45

Q And that's a -- that's representing that the output of the FFT noise processing is performed on the output of the FFT; is that right? 09:46:46 09:46:50 09:46:54

A Yes. 09:47:10

Q Okay. And the idea of doing noise processing on the output of an FFT, that was known in the art as of February 1999? 09:47:11 09:47:16 09:47:19

A Noise processing via FFT was known in the technologies related to noise suppression within the art. 09:47:29 09:47:35 09:47:38

Q As of 1999? 09:47:40

A Yes, but that's not referring to this specific technique. 09:47:44 09:47:47

Q What do you mean by "this specific technique"? 09:47:49 09:47:50

A Well, '345 is a system, method and apparatus for canceling noise. So it describes a set of processes for performing that. 09:48:05 09:48:07 09:48:11

Q Uh-huh. And are any of those processes novel? 09:48:13 09:48:18

MR. LENNIE: Objection. 09:48:19

A Yes. 09:48:20

MR. LENNIE: Objection. Form. 09:48:20

Q Which? 09:48:21

MR. LENNIE: Same objection. 09:48:26

A The '345 patent is an apparatus for canceling noise, and it's novel in many respects, one of them being the use of threshold detection for setting a threshold for each frequency bin using a noise estimation process and for detecting for each frequency bin whether the magnitude of the -- 09:52:07 09:52:10 09:52:15 09:52:19 09:52:22 09:52:32

(Reporter interruption.) 09:52:33

A Detecting for each frequency bin whether the magnitude of the frequency bin is less than the corresponding threshold, thereby detecting positions of noise elements for each frequency bin. 09:52:34 09:52:34 09:52:36 09:52:40

Q And were you just reading from the language of claim 1? 09:52:43 09:52:45

A I was. 09:52:47

Q Okay. Is there anything else novel in the 09:52:47

'345 patent? 09:52:51

MR. LENNIE: Objection. Form. 09:52:52

A There are many aspects of the system that 09:52:59

are novel. All -- you know, those aspects which 09:53:02

relate to or depend upon claim 1 matter as well. 09:53:09

Q Uh-huh. 09:53:12

A As well as other claims within there. 09:53:13

Q Do you have an opinion as to what -- what 09:53:18

was inventive in the '345 patent over the prior art? 09:53:21

MR. LENNIE: Objection. Form. 09:53:26

A I've been asked to provide opinions that 09:53:56

relate to the report of Dr. Kyriakakis regarding the 09:53:59

validity of this patent. So I provided opinions along 09:54:09

that line. 09:54:12

Regarding your question, it's a challenge to 09:54:14

think of all the different possibilities of novelty 09:54:17

that one could consider for this. 09:54:20

Q Uh-huh. Is there anything -- can you name 09:54:22

anything in the '345 patent that was not just novel 09:54:28

but was inventive over the prior art? 09:54:32

MR. LENNIE: Objection. Form. 09:54:36

A An invention is a combination of its 09:54:39

elements and, you know, the novelty can be in the combination, it can be in the individual portions. 09:54:42 09:54:45

Q Okay. And what was the invention -- in your view, what was the invention of the '345 patent? 09:54:52 09:54:55

MR. LENNIE: Objection. Form. 09:54:59

A I don't know if I have a view that points to one specific thing or feature. 09:55:12 09:55:15

Q Can you point to anything in the patent that was an invention over the prior art? 09:55:18 09:55:19

MR. LENNIE: Objection. Form. 09:55:22

A Again, the nature of the invention is in the combination of its elements and how the various different techniques are combined to produce the processing that it does. 09:55:23 09:55:27 09:55:30 09:55:33

Q And the techniques in the '345 patent, were those combined in a way that was inventive over the prior art? 09:55:36 09:55:40 09:55:44

A Yes. 09:55:46

Q How so? 09:55:47

A In the specific way, I mean it's the methodology that was used. 09:55:49 09:55:52

Q What techniques -- when you say "the 09:56:04

techniques of the patent," what techniques are you referring to? Are you referring to the technique for estimating noise? 09:56:06 09:56:09 09:56:12

MR. LENNIE: Objection. Form. 09:56:13

A Again, the novelty of the patent is in the combination of the various elements to produce the resulting processing that it does. 09:56:23 09:56:28 09:56:31

Q What elements are you referring to? 09:56:41

A (Reviewing.) 09:57:01

Well, the noise processing and the noise estimation processing as well as the subtraction processing and residual noise processing. 09:57:11 09:57:14 09:57:19

Q Are you saying each of those on their own were inventive or the combination of those were inventive -- was inventive? 09:57:26 09:57:29 09:57:33

MR. LENNIE: Objection. Form. 09:57:35

Q Strike that. 09:57:48

Was residual noise processing by itself an invention over the prior art? 09:57:50 09:57:54

MR. LENNIE: Objection. Form. 09:58:00

A The general goal of residual noise processing was under -- was a technique which was 09:58:08 09:58:11

investigated. There are methods for doing it -- there are other methods, though -- excuse me, strike that issue -- there are other methods. 09:58:16 09:58:19 09:58:24

The '345 patent uses residual noise processing along with its other methods to provide the capability of the patent that is described. 09:58:30 09:58:34 09:58:39

Q Was the residual noise processing described in the '345 patent by itself an invention over the prior art? 09:58:43 09:58:45 09:58:50

MR. LENNIE: Objection. Form. 09:58:53

A (Reviewing.) 09:58:54

As I understand it, the novelty of the patent can be in the combination of its elements and in the way the processing is combined to provide the resulting system operation. 09:59:20 09:59:23 09:59:26 09:59:30

Q Uh-huh. But residual noise processing predated the '345 patent, right? 09:59:35 09:59:37

A There was residual noise processing methods prior to the '345 patent. 09:59:42 09:59:45

Q Okay. And there were noise estimation processes prior to the '345 patent, right? 09:59:46 09:59:49

A Yes. There are methods for estimating noise 09:59:54

in systems. 09:59:57

Q Okay. And there were noise processing 09:59:58

methods prior to the '345 patent, right? 10:00:01

A Yes, there was noise processing systems. 10:00:06

Q And there were subtraction processing 10:00:10

methods prior to the '345 patent? 10:00:12

A Yes, there were those as well. 10:00:16

Q Uh-huh. Just going back to claim 1, is your 10:00:19

opinion that claim 1 is novel over the prior art? 10:00:40

A Yes. 10:00:49

(Exhibit 3 was marked for identification and 10:01:09

is attached to the transcript.) 10:01:09

Q This is the expert report of 10:01:41

Chris Kyriakakis, the Respondents' expert on 10:01:44

invalidity; is that right? 10:01:49

A Yes. 10:01:50

Q Have you seen this before? 10:01:51

A Yes. 10:01:53

Q Have you reviewed this? 10:01:54

A Yes. 10:01:56

Q And you were asked to respond to 10:01:57

Dr. Kyriakakis's opinions expressed in this report; is 10:01:59

that right? 10:02:03

A Yes. 10:02:04

Q Can you turn to Page 213 of the report? 10:02:20

A Yes. 10:02:39

Q And do you see Paragraph 648? 10:02:40

A I do. 10:02:46

Q Okay. And the first sentence of that 10:02:47

paragraph reads, "It is my opinion that Diethorn" -- 10:02:49

D-I-E-T-H-O-R-N. 10:02:53

A Right. 10:02:57

Q -- "anticipates claim 1 of the '345 patent 10:02:58

if the claim is not subject to Section 112, Paragraph 10:03:01

6." 10:03:04

A Uh-huh. 10:03:04

Q Do you see that? 10:03:05

A I do. 10:03:05

Q Do you disagree with that opinion? 10:03:07

A I haven't provided an opinion on this issue 10:03:28

in my report. 10:03:31

Q Why not? 10:03:36

A In the process of writing the report and 10:03:41

considering the technical issues in it, I was asked 10:03:45

not to consider this particular issue at the point of preparing -- at -- in the process of preparing the report. 10:03:52 10:03:56 10:03:59

Q You were asked by the lawyers for Andrea? 10:04:01

A It was part of our dis- -- a dis- -- our discussion. 10:04:06 10:04:09

Q So they instructed you not to render an opinion as to Diethorn? 10:04:10 10:04:13

MR. LENNIE: I'm just going to cau- -- go ahead and finish the question. 10:04:16 10:04:18

Q Did the lawyers instruct you not to analyze whether Diethorn anticipates it? 10:04:19 10:04:22

MR. LENNIE: So I'm just going to interject here that I understand that there's a discovery stipulation that indicates that the discussions between -- communications between counsel and the witness are non-discoverable -- 10:04:25 10:04:27 10:04:29 10:04:34 10:04:37

MR. SWANSON: Uh-huh. 10:04:40

MR. LENNIE: -- unless the witness is relying on those communications. 10:04:42 10:04:43

MR. SWANSON: I think I'm entitled to ask him if -- what he was asked to do. Do you agree? 10:04:47 10:04:48

MR. LENNIE: I do. 10:04:53

MR. SWANSON: All right. 10:04:53

BY MR. SWANSON: 10:04:53

Q Were you asked to analyze whether Diethorn 10:04:54

anticipates claim 1 of the '345 patent? 10:04:58

A I was asked to consider Diethorn in the 10:05:03

context of the patent and all of the aspects of 10:05:05

Diethorn with respect to all of the claims. 10:05:09

Q And did you form an opinion as to whether 10:05:12

Diethorn anticipates claim 1? 10:05:14

A I did not. 10:05:16

Q Why not? 10:05:17

A The report is long, almost 300 pages, I 10:05:25

believe. It -- it took some time to do and at some 10:05:30

point in looking at the issues, it became a 10:05:36

challenging issue to be able to address. 10:05:40

Q Challenging in what respect? 10:05:44

A In trying to think about the aspects, it 10:05:49

wasn't obvious to me, in terms of the amount of time. 10:05:51

I -- I had to take time on various different things to 10:05:55

be able to address the various different aspects of 10:05:58

the rebuttal response for my report. 10:06:02

Q Uh-huh. So are you saying you did not form an opinion as to Diethorn on claim 1 because you ran out of time? 10:06:04 10:06:09 10:06:14

MR. LENNIE: Objection. Form. 10:06:15

A We made choices with respect to what aspects of various different portions of the rebuttal report we would -- we would spend effort on. It wasn't running out of time, though. 10:06:20 10:06:23 10:06:27 10:06:31

Q But you said you were asked to look at all aspects of Diethorn with respect to all of the claims, right? 10:06:34 10:06:36 10:06:39

A I was asked to consider various aspects. I don't have an opinion at this point in time. I wasn't able to form an opinion about them. 10:06:42 10:06:46 10:06:50

Q Okay. And why were you not able to form an opinion? 10:06:52 10:06:57

MR. LENNIE: Objection. Form. 10:06:59

A I -- it just became a choice from the standpoint of looking at the various different items. I mean, I looked at different aspects of different references. 10:07:01 10:07:08 10:07:10 10:07:15

Q Uh-huh. So you chose not form an opinion or 10:07:17

you were -- 10:07:23

A No, I didn't choose not to form an opinion. 10:07:28

Q Okay. Sitting here right now, do you 10:07:31

have -- do you have an opinion as to whether Diethorn 10:07:35

anticipates claim 1? 10:07:37

A I do not. 10:07:40

Q Was there a -- strike that. 10:08:07

Earlier in your testimony you said you have 10:08:18

an opinion. In your opinion claim 1 is novel, right? 10:08:21

A I believe I said that, yes. 10:08:32

Q Okay. Does that include -- by that did you 10:08:33

mean claim 1 is novel over Diethorn? 10:08:39

MR. LENNIE: Objection. Form. 10:08:42

A At this point I don't have an opinion on 10:08:52

that. 10:08:54

Q How are you able to form an opinion that 10:08:54

claim 1 is novel if -- if you are unable to form an 10:08:56

opinion as to whether it's novel over Diethorn? 10:08:59

MR. LENNIE: Objection. Form. 10:09:03

A I haven't gotten to conclusions regarding 10:09:34

Diethorn, so I -- I can't say about with respect to 10:09:40

that reference. 10:09:43

Q In the course of providing your opinions in this case, you looked at the Diethorn reference? 10:09:49 10:09:51

A I did. 10:09:56

Q And you studied that reference? 10:09:57

A I spent time looking at it, yes. 10:10:00

Q And you did render opinions on Diethorn with respect to other claims of the '345 patent, right? 10:10:02 10:10:05

A Yes, I did. 10:10:08

Q Can I direct you back to the '345 patent? 10:10:22

A Sure. 10:10:26

Q You can put the Kyriakakis report to the side for now. 10:10:27 10:10:30

Okay. Can you look at the claims? 10:10:55

A Uh-huh. 10:11:00

Q Specifically claim 13? 10:11:03

A Uh-huh. 10:11:06

Q Claim 13 depends from claim 1; is that right? 10:11:09 10:11:12

A Yes. 10:11:13

Q And claim 13 adds a limitation of a subtractor for subtracting said noise elements estimated at said positions determined by said 10:11:15 10:11:22 10:11:26

threshold detector from said audio signal -- sorry -- to derive said audio signal substantially without said noise. 10:11:28 10:11:30 10:11:37

Do you see that? 10:11:39

A I do. 10:11:40

Q Is that limitation describing the process of spectral subtraction? 10:11:43 10:11:47

MR. LENNIE: Objection. Form. 10:11:48

A (Reviewing.) 10:12:16

It's describing elements of systems that employ spectral subtraction. It's describing methodologies that are within the '345 patent. 10:12:29 10:12:37 10:12:42

Q And within the prior art, correct? 10:12:45

MR. LENNIE: Objection. Form. 10:12:53

A It's not describing techniques in prior art specifically because it's describing things related to threshold detection and setting thresholds for each frequency bin using a noise estimation process and also detecting for each frequency bin where the magnitude of the frequency bin is less than the corresponding threshold, thereby detecting the positions of noise elements. 10:13:10 10:13:14 10:13:19 10:13:22 10:13:26 10:13:29 10:13:31 10:13:34

Q Okay. I just want to focus on the additional step in claim 13, subtracting said noise elements. 10:13:36 10:13:38 10:13:43

The '345 -- did the '345 inventors invent the idea of subtracting noise elements from an audio signal? 10:13:44 10:13:52 10:13:58

MR. LENNIE: Objection. Form. 10:13:59

A (Reviewing.) 10:14:26

The '345 patent is an invention which relates to noise cancellation and reduction and to noise cancellation/reduction using spectral subtraction. 10:14:35 10:14:37 10:14:41 10:14:44

Q Uh-huh. The step of subtracting noise elements from an audio signal, was that known in the art? 10:14:45 10:14:52 10:14:55

MR. LENNIE: Objection. Form. 10:15:02

A I mean, the general concept of being able to do subtraction was known. The methodologies of various techniques are different. 10:15:03 10:15:07 10:15:10

Q And the additional limitation of claim 13, subtracting said noise -- and I won't read all of it -- but the additional limitation of claim 13, was 10:15:18 10:15:21 10:15:24

that in the prior art as of the time of the patent? 10:15:28

MR. LENNIE: Objection. Form. 10:15:34

A No, it wasn't, because of the way the 10:15:37

methods have been combined in the '345 patent. 10:15:39

Q So it's your opinion that subtracting said 10:15:44

noise elements estimated at said positions determined 10:15:48

by said threshold detector from said audio signal was 10:15:51

novel? 10:15:57

A It was novel in relation to the 10:15:57

methodologies that are described in the '345 patent. 10:15:59

Q You agree there are prior art methods of 10:16:03

estimating noise, right? 10:16:06

A Yes. 10:16:08

Q Okay. So let's put aside the -- the '345's 10:16:08

technique for how you estimate the noise. 10:16:14

Once you have a noise estimate, was the step 10:16:18

of subtracting the estimated noise from an audio 10:16:21

signal known as of the time of the patent? 10:16:24

A There were methods that -- that were known 10:16:31

and could be applied to do that sort of technique. 10:16:32

Q Okay. In fact, Boll describes one of those 10:16:35

techniques, right? 10:16:58

A One of what technique? 10:17:00
Q The technique you just mentioned, 10:17:02
subtracting noise estimates from an audio signal. 10:17:04
A I mean, Boll describes a meth- -- a 10:17:07
particular method of spectral subtraction -- 10:17:10
Q Uh-huh. 10:17:13
A -- that he's designed for that particular 10:17:13
problem using his particular techniques. 10:17:15
Q Right. Boll -- Boll described a process for 10:17:17
estimating noise, right? 10:17:21
A He used methods for estimating noise, yes. 10:17:28
Q And he also described how to subtract that 10:17:31
noise from an audio signal, correct? 10:17:35
A He described a technique for subtracting 10:17:38
that noise from an audio signal. 10:17:40
Q Okay. As of the time of the '345 patent, 10:17:45
would a person of skill in the art have been capable 10:18:25
of implementing the technique for subtracting noise 10:18:28
elements from an audio signal? 10:18:34
MR. LENNIE: Objection. Form. 10:18:37
A What do you mean by "subtracting noise 10:18:38
elements from an audio signal"? 10:18:40

Q Do you have an understanding of what it means to subtract noise elements from an audio signal? 10:18:43 10:18:44

A Well, in the context of the '345 patent, there are techniques that are described for doing it. The rea- -- you used terms that are within the claim language; that's the reason why I'm asking the question. 10:18:48 10:18:50 10:18:52 10:18:54 10:18:56

Q What are the techniques for subtracting noise elements in the '345 patent? 10:18:57 10:18:59

A (Reviewing.) 10:19:01

The specification describes a particular embodiment of the invention. Figure 4 provides a detailed description of the subtraction process and indicates elements that are being used to perform subtraction. 10:19:54 10:20:09 10:20:13 10:20:16 10:20:20

Q Can you turn to Figure 4? 10:20:32

A (Complying.) 10:20:36

Q What's -- what's being shown in Figure 4? 10:20:45

A It shows the processing of the subtraction process. 10:20:48 10:20:52

Q There are -- there are two steps in Figure 4, 402 and 404; is that right? 10:20:54 10:20:55

A Yes, it contains those two blocks. 10:20:59

Q Okay. What does step 402 show? 10:21:02

A (Reviewing.) 10:21:19

Step 402 shows Y(n), the magnitude of the 10:21:20
current bin, and N(n), the noise estimation of that 10:22:11
bin, being used in a filter process to compute H(n). 10:22:16

Q Is that process known as filter 10:22:25
multiplication? 10:22:27

A It is. 10:22:30

Q And that was known in the art? 10:22:31

A (Reviewing.) 10:22:45

The process of filter multiplication is one 10:24:09
way to implement such systems. 10:24:12

Q By "such systems" do you mean spectral 10:24:17
subtraction systems? 10:24:19

A I mean systems that employ noise processing 10:24:20
and noise reduction. 10:24:24

Q And filter multiplication was known in the 10:24:26
art as of the time of the '345 patent? 10:24:29

MR. LENNIE: Objection. Form. 10:24:46

A The process of performing filtering with 10:24:47
multiplication was understood. The process of 10:24:50

performing filter multiplication in the context of all the different aspects of this patent, you know, I'm ... 10:24:52 10:24:56 10:24:59

Q Were you done with that answer? 10:25:04

A It -- it's in combination with other methods where this patent is en- -- is enabling its functionality. 10:25:09 10:25:11 10:25:15

Q Uh-huh. But the process of filter multiplication by itself was understood in the art as of the time of the patent, right? 10:25:15 10:25:18 10:25:20

A The process of filter multiplication was understood with respect to certain aspects of certain systems being implemented. The relative advantages of those lead one to use techniques in specific ways for -- for a particular invention. 10:25:36 10:25:39 10:25:44 10:25:48 10:25:57

Q Had the particular formula shown in 402 of Figure 4 of the '345 patent -- 10:26:01 10:26:04

A Uh-huh. 10:26:06

Q -- been used in prior art spectral subtraction systems? 10:26:06 10:26:09

A The particular formula depends upon quantities that are going into it. So the quantities 10:26:12 10:26:15

that are being used, you know, depend upon other processing methods. So the overall computation is not. I'm saying the overall computation, including the way Y(n) is calculated, is not. 10:26:17 10:26:20 10:26:24 10:26:26

Q Is not what? 10:26:30

A Because of the techniques that are being used to perform those. 10:26:32 10:26:34

MR. SWANSON: Can you mark this as Exhibit 4. 10:26:43 10:26:44

(Exhibit 4 was marked for identification and is attached to the transcript.) 10:26:44 10:26:44

Q Is Exhibit 4 the Boll paper that we talked about earlier? 10:27:19 10:27:21

A It is. 10:27:23

Q This is the paper that's referenced in the '345 patent? 10:27:24 10:27:26

A It is. 10:27:28

Q Okay. And you're familiar with this paper? 10:27:29

A I am. 10:27:31

Q Can you please turn to Page 116 of Boll? 10:27:39

A (Complying.) 10:27:49

Q The Bates number ends in 56673, for the 10:27:53

record. 10:27:57
And can I direct to the right-hand column -- 10:28:01
A Uh-huh. 10:28:07
Q -- under the heading "Bias Removal and Half-Wave Rectification"? 10:28:07
A Yes. 10:28:10
Q And the first sentence under that heading reads, "The spectral subtraction spectral estimate S hat" -- 10:28:11
A Uh-huh. 10:28:24
Q -- "is obtained by subtracting the expected noise magnitude spectrum from the magnitude signal spectrum." 10:28:29
Do you see that? 10:28:29
A I do. 10:28:29
Q And then it provides two formulas? 10:28:31
A Yes. 10:28:35
Q Is the second formula showing filter multiplication? 10:28:38
A The second formula is showing the multiplication of a quantity H, which is not here -- I don't see what H is -- oh, here it is -- H is here -- 10:28:39
10:28:39
10:28:43
10:28:46
10:28:51
10:29:13
10:29:15
10:29:19

which -- by X(k), so it's showing multiplication. 10:29:22

Q That's a filter multiplication? 10:29:26

A It's a multiplication of an input signal by a -- a coefficient. 10:29:32

Q Uh-huh. The input signal here is represented by the variable X; is that right? 10:29:39

A Yes. 10:29:48

Q Okay. And Hk is representing the filter; is that right? 10:29:50

A That would be the coefficient. 10:29:56

Q Right. So -- and that's the -- the first part of that formula, where it says S hat equals H -- H(k) times X(k)? 10:30:00

A Yes. 10:30:10

Q Is that right? 10:30:13

And after that there's a definition of H(k); do you see that? 10:30:14

A I do. 10:30:21

Q And that's showing the same formula as box 402 of the '345 patent? 10:30:23

A No, it's not. 10:30:24

Q Why not? 10:30:28

10:30:32

10:30:33

A In box 402 there is two bars to the left and right of the numerator which performs a calculation which is not part of Boll. 10:30:34 10:30:45 10:30:50

Q You're talking about the -- the absolute values? 10:30:54 10:30:57

A Yes, I am. 10:30:57

Q Okay. Other than those absolute values, is that the same mathematical formula? 10:30:58 10:31:04

A I don't understand what you mean. 10:31:07

Q Putting aside the abso- -- the absolute value bars that are missing in Boll -- 10:31:08 10:31:12

A Yes. 10:31:15

Q -- is that the same mathematical formula? 10:31:16

A It's -- if you change -- if you remove the absolute value bars, you change the mathematical formula. 10:31:19 10:31:21 10:31:24

Q Uh-huh. This is showing -- in Boll this is showing the noise estimate divided by the signal, correct? 10:31:25 10:31:34 10:31:39

A Noise estimate? I don't -- I'm -- I'm not sure what you mean. 10:31:43 10:31:45

Q Do you see the Greek character Mu in Boll? 10:31:52

A I do. 10:31:56
Q And the sentence before the formula is 10:31:57
that's -- it says that that's the expected noise 10:31:59
magnitude spectrum, right? 10:32:01
A I see it says that, yes. 10:32:04
Q Okay. So Mu is the noise estimate? 10:32:05
A Mu is the expected value of the noise 10:32:11
magnitude spectrum as he's defined it. 10:32:14
Q Right. Which is the noise estimate? 10:32:18
A It's an expected noise magnitude spectrum. 10:32:20
Q How is that different from a noise estimate? 10:32:23
A There are various ways to estimate noise. 10:32:25
It doesn't describe how the estimation is done and how 10:32:28
the expectation is done. 10:32:33
Q But in Boll that's treated as a noise 10:32:35
estimate, right? 10:32:38
A It's treated as an expected noise magnitude 10:32:40
spectrum. 10:32:43
Q Which in Boll is his estimated noise? 10:32:49
A It's an estimate at each frequency bin. 10:32:56
Q An estimate of the noise? 10:32:59
A Of the expected value of the noise magnitude 10:33:01

spectrum. 10:33:04

Q Is that different from the noise at each frequency bin? 10:33:09 10:33:13

MR. LENNIE: Objection. Form. 10:33:16

A Where are you getting the second aspect of the noise at each frequency -- where are you referring to that? 10:33:20 10:33:22 10:33:25

Q Well, I was asking if Mu is -- Mu of K is the noise estimate, and you keep saying that it's the expected noise magnitude spectrum. 10:33:26 10:33:31 10:33:37

A Correct. 10:33:39

Q And I'm asking, is there a difference between the noise estimate and the expected noise magnitude spectrum? 10:33:40 10:33:42 10:33:46

A What noise estimate are you talking about? 10:33:48

Q Well, Boll estimates the noise at each frequency bin, right? 10:33:50 10:33:53

A Boll uses an estimate of each frequency bin of the expected value of the noise magnitude spectrum. 10:34:00 10:34:03

Q Which is Boll's estimate of the noise, right? 10:34:07 10:34:09

MR. LENNIE: Objection. Form. 10:34:11

A Mun, as he describes it, is the expected value of the noise magnitude spectrum at a frequency bin. 10:34:37 10:34:41 10:34:47

MR. HASLAM: This is Bob Haslam. I have to leave now, rejoin this deposition later. 10:34:55 10:34:56

Q Okay. You agree that Boll in the second formula is showing a filter multiplication; is that right? 10:35:31 10:35:35 10:35:39

A He's multiplying an input sample by a coefficient. 10:35:51 10:35:54

Q And the coefficient is a filter? 10:35:56

A It is the val- -- it is H, as indicated in this expression. 10:36:03 10:36:06

Q And H in this expression is a filter? 10:36:08

A H represents one quantity within the system. Doesn't represent a filter by itself. 10:36:19 10:36:24

Q What is that quantity? 10:36:27

A It's a coefficient that's multiplying the -- the input sample. 10:36:32 10:36:34

Q How is it derived? 10:36:36

A There's an equation for it, 1 minus Mu K over absolute value of X(k). 10:36:42 10:36:45

Q And what does that equation represent? 10:36:50
A It represents a coefficient that's 10:36:55
multiplying the input sample. 10:36:57
Q For the purpose of reducing the noise in the 10:37:01
signal? 10:37:03
A Yeah, Boll speaks of a stand-alone noise 10:37:08
suppression algorithm. 10:37:12
Q Can you look at Page 114 under the heading 10:37:13
on the left-hand column "Spectral Subtraction 10:37:23
Estimator"? 10:37:27
Do you see that? 10:37:27
A I do. 10:37:29
Q Okay. And the first sentence says, "The 10:37:30
spectral subtraction filter H." 10:37:33
Do you see that? 10:37:35
A Uh-huh. I do. 10:37:36
Q So do you now agree that H is the spectral 10:37:37
subtraction filter? 10:37:40
A He uses slightly different notation here. 10:37:45
The notation he -- he is using considers values across 10:37:53
different frequencies. 10:38:01
Q But it is a spectral subtraction filter? 10:38:05

A As Boll stated, it's the spectral subtraction filter he's using. 10:38:08 10:38:13

Q Okay. Turning back to the '345 patent and just looking again at Figure 402, is there anything unconventional about this filter multiplication formula? 10:38:16 10:38:27 10:38:36 10:38:42

MR. LENNIE: Objection. Form. 10:38:43

A I don't understand what you mean by "unconventional." 10:38:48 10:38:49

Q Was this filter multiplication being done in a way that deviated from the prior art? 10:38:51 10:38:54

MR. LENNIE: Objection. Form. 10:38:57

A What art are you referring to? 10:39:05

Q Just the prior art in general -- 10:39:07

A In general? 10:39:09

Q -- as of 1999? 10:39:09

A It deviates from Boll. 10:39:15

Q Because of the absolute values? 10:39:17

A Well, that's -- it performs an absolute value calculation that changes the nature of the calculation. 10:39:20 10:39:23 10:39:26

Q Is there any other way in which it deviates? 10:39:27

A Well, as I said, Y(n) and N(n) are used to compute it and the methodologies for those which are not described in this. 10:39:30 10:39:36 10:39:38

Q Uh-huh. But just the multi- -- the filter calculation itself -- 10:39:40 10:39:42

A Uh-huh. 10:39:44

Q -- is there any other way in which that deviates from Boll? 10:39:44 10:39:46

A I mean, the calculations are different. 10:40:32

Q How? 10:40:36

A Well, there is the absolute value. 10:40:37

Q Uh-huh. Anything else? 10:40:40

A And again, the way Y(n) and N(n) are computed as input into this with respect to other parts of the patent. 10:40:45 10:40:49 10:40:53

Q I'm not talking about how they're computing, but just this formula here in 402 -- 10:40:54 10:40:56

A Uh-huh. 10:40:59

Q -- is there anything else other than the absolute values that differs from Boll? 10:41:00 10:41:01

A There can be choices of lengths of windows used in the processing, there can be other aspects of 10:41:04 10:41:09

the systems that are not represented in this particular block in the way the calculations are done which are not represented here. 10:41:13 10:41:15 10:41:18

Q Okay. But those -- any such differences aren't represented here in 402? 10:41:20 10:41:23

A They are part of the implementation process when one is implementing systems like this. 10:41:30 10:41:32

Q But they're not shown in 402? 10:41:45

A I don't know what you mean by "not shown in 402." 10:41:48 10:41:50

Q Those other -- strike that. 10:41:51

Can you turn to column 7 of the patent, and starting at line 1, the sentence beginning, "Alternative approach," then down through line 8 or 9, shows that same formula as 402? 10:41:59 10:42:19 10:42:22 10:42:29

A Yes. 10:42:34

Q Is that -- that right? 10:42:34

The '345 patent doesn't say that this is a new filter multiplication approach, does it? 10:42:35 10:42:38

A (Reviewing.) 10:42:52

THE WITNESS: Could you read back the question? 10:42:53 10:45:03

(Pending question was read.) 10:45:03

A The '345 patent says, "... the present 10:45:19
invention applies to filter multiplication to effect 10:45:21
the subtraction. The filter function, a Wiener filter 10:45:25
function for example, or an approximation of the 10:45:28
Wiener filter is multiplied by the complex data of the 10:45:30
frequency domain audio signal." 10:45:30

This is how it characterizes that. 10:45:31

Q Right, but the patent is not saying that the 10:45:38
filter multiplication used here is novel over the 10:45:42
prior art, does it? 10:45:46

A It's describing the methodology of how the 10:45:51
filter function may effect a full-wave rectification 10:45:57
or a half-wave rectification or otherwise negative 10:45:59
results of the subtraction process or simple 10:46:03
subtraction. 10:46:07

It's an element of the system which, in 10:46:10
combination with other elements, allows the system 10:46:14
to -- to be implemented. 10:46:16

Q Okay. But the patent does not claim to have 10:46:32
invented a new filter multiplication technique, does 10:46:39
it? 10:46:42

MR. LENNIE: Objection. Form. 10:46:44

A The patent claims an apparatus according to claim 13 -- I'm reading from claim 14 -- wherein said subtractor performs subtraction using a filter multiplication which multiplies said audio signal by a filter function. 10:47:20 10:47:24 10:47:28 10:47:29 10:47:34

Q Right. And the patent doesn't purport to have invented a new filter multiplication technique? 10:47:37 10:47:40

A This technique should be viewed in combination with the other features of the patent. 10:47:48 10:47:49

Q Let's assume claim 1 is invalid, okay? Assuming claim 1 is invalid, does the additional limitation of claim 13 make that claim patentable over claim 1? 10:47:58 10:48:06 10:48:12 10:48:16

MR. LENNIE: Objection. Form. 10:48:19

A I -- I think that's why we're here in these sorts of proceedings, to try to decide this. I don't know as a technical expert whether I'm here to decide that sort of aspect of the issue. 10:48:19 10:48:32 10:48:35 10:48:38

Q You don't have an opinion on that? 10:48:40

MR. LENNIE: Objection. Form. 10:48:45

A Well, the invention is -- or has aspects 10:48:46

which are novel, and I'm not here to render an opinion where, you know, said subtractor performs subtraction using a filter multiplication which multiplies said audio signal by a filter function is novel. 10:49:01 10:49:11 10:49:14 10:49:17

Q Okay. So you have no opinion on whether claim 1 would be valid if claim 1 is invalid? 10:49:21 10:49:23

MR. LENNIE: Objection. Form. 10:49:28

A I -- I'm confused by your statement. You said claim 1 is valid if claim 1 is invalid. This doesn't make sense to me. 10:49:30 10:49:35 10:49:39

Q Okay, let me rephrase. 10:49:40

Do you have an understanding that as a legal matter if an independent claim, like claim 1 here, is invalid, the claims that depend from claim 1 can nevertheless be found not invalid? 10:49:41 10:49:44 10:49:49 10:49:54

MR. LENNIE: Objection. Form. 10:49:58

Q If they are novel and nonobvious over the independent claim? 10:49:59 10:50:02

MR. LENNIE: Same objection. 10:50:03

A (Reviewing.) 10:50:09

MR. BAIK: Just for the record, what is the witness looking at? 10:50:39 10:50:40

THE WITNESS: I'm looking at the rebuttal expert report of my own. 10:50:42 10:50:44

A (Reviewing.) 10:52:19

I am not a lawyer, but I understand that a patent claim that contains several elements may not be obvious because all -- just because all of the claim elements are individually known in the prior art. 10:52:19 10:52:21 10:52:26 10:52:28

Q Okay. And I'm asking about the difference between independent and dependent claims, understanding that you're not a lawyer, but do you have an understanding that if an independent claim is invalid, that a dependent claim can be not invalid if it's novel and nonobvious over the independent claim? 10:52:33 10:52:35 10:52:37 10:52:39 10:52:43 10:52:49

MR. LENNIE: Objection. Form. 10:52:55

A Again, I'm not a lawyer. Could you restate -- restate your question. 10:53:00 10:53:02

Q Sure. Was there something you didn't understand about it or you just want me to repeat the question? 10:53:04 10:53:06 10:53:10

A You can repeat the question. 10:53:10

Q Okay. Do you have an understanding that as a legal matter if an independent claim is invalid, a 10:53:12 10:53:13

claim that depends from that independent claim can be found not invalid if it's novel and nonobvious over the independent claim? 10:53:18 10:53:23 10:53:27

MR. LENNIE: Same objection. 10:53:31

A I understand dependent claims depend upon independent ones. The question of obviousness or non-obviousness is something that I am here to provide opinions on with respect to the report that Dr. Kyriakakis has provided. 10:53:54 10:53:59 10:54:04 10:54:09 10:54:12

Q Okay. And are you -- let me just go back to my earlier question, just trying to understand what -- what you have opinions on and what you don't have opinions on in this case. 10:54:16 10:54:21 10:54:23 10:54:27

If we assume claim 1 is invalid, is it your opinion that claim 13 is novel and nonobvious over claim 1? 10:54:29 10:54:35 10:54:39

A That's a difficult question. I would have to think about that. 10:54:50 10:54:52

Q You haven't thought about that before today? 10:54:54

A I haven't been considering scenarios where claim 1 is invalid, no. You case it in the context of if claim 1 is invalid. 10:54:58 10:55:03 10:55:10

Q Even though you decided not to offer an opinion, you decided not to dispute Dr. Kyriakakis's opinion that claim 1 is invalid over Diethorn? 10:55:13 10:55:15 10:55:20

MR. LENNIE: Objection. Form. 10:55:27

A I haven't formed an opinion on that issue. 10:55:28

Q Okay. So sitting here today you have no opinion as to whether claim 13 represents a novel and nonobvious distinction over claim 1? 10:55:30 10:55:33 10:55:39

MR. LENNIE: Objection. Form. 10:55:47

A I would have to give it some specific thought. I haven't thought through the process of taking out claims to try to then insert other ones. 10:55:52 10:55:53 10:55:57

Q And you haven't yet rendered an opinion on that issue in this case? 10:56:00 10:56:03

MR. LENNIE: Objection. Form. 10:56:05

A (Reviewing.) 10:56:21

Speaking with respect to Diethorn, Diethorn does not anticipate claim 13 of the '345 patent. And it doesn't guarantee, for example, that the gain value is less than one when noise values are detected. 10:56:22 10:59:37 10:59:42 10:59:45

Q Uh-huh. Are you talking -- you're looking at your expert report? 10:59:48 10:59:55

A I'm using it to recall what I know about Diethorn, yes. 10:59:58 11:00:00

Q Okay. So I'm not asking about Diethorn specifically. I'm asking whether if you assume claim 1 is invalid, whether the additional limitation of claim 13 represents -- makes that claim patentable above and beyond claim -- claim 1? 11:00:02 11:00:05 11:00:11 11:00:15 11:00:22

A I -- I haven't thought through -- 11:00:24

MR. LENNIE: Objection. Form. 11:00:26

A I haven't thought through the process that would allow me to make that determination at this point in time. 11:00:26 11:00:30 11:00:32

Q Okay. If you assume claim 13 is invalid over the prior art, do you have an opinion as to whether the additional limitation of claim 14 -- let me strike that. 11:00:33 11:00:36 11:00:38 11:00:42

Can we look at claim 14? Claim 14 depends from claim 13; is that right? 11:00:45 11:00:49

A Yes. 11:00:51

Q And claim 14, the additional limitation is that the said subtractor performs subtraction using a filter multiplication which multiplies said audio 11:00:52 11:00:57 11:01:03

signal by a filter function? 11:01:05

A Uh-huh. 11:01:09

Q Right? 11:01:09

A Yes. 11:01:10

Q Sitting here today, do you have an opinion -- let me start over. 11:01:11 11:01:12

Assuming claim 13 is invalid, do you have an opinion as to whether the additional limitation of claim 14 makes that claim patentable over claim 13? 11:01:15 11:01:20 11:01:25

MR. LENNIE: Objection. Form. 11:01:30

A Again, I haven't thought through processes that would -- that would consider both claims 1 and claims 13 invalid in order to try to decide whether 14 is valid. I haven't considered that issue. 11:01:31 11:01:34 11:01:37 11:01:43

Q And if you look at claim 15, claim 15 depends from claim 14; is that right? 11:01:50 11:01:57

A Yes. 11:01:59

Q The additional limitation of claim 15 is that said filter function is a Wiener filter function which is a function of said frequency bins of said noise elements of magnitude. 11:02:02 11:02:06 11:02:09 11:02:12

Do you see that? 11:02:14

A Uh-huh. Yes. 11:02:15

Q Do you have an understanding of what a Wiener filter is? 11:02:16 11:02:17

A I do. 11:02:19

Q What is a Wiener filter? 11:02:19

A It is a filter that is designed to reduce noise according to a specific criterion. 11:02:35 11:02:43

Q What's the purpose of using a Wiener filter? 11:02:51

A The purpose of a Wiener filter is to reduce noise. 11:02:55 11:02:58

Q What's the purpose of using a Wiener filter over the filter multiplication shown in Figure 4 of the '345 patent? 11:02:59 11:03:01 11:03:07

MR. LENNIE: Objection. Form. 11:03:09

A I guess I don't understand the question. 11:03:14

Q Why would you -- so Figure 4 of the '345 patent shows filter multiplication, right? 11:03:18 11:03:23

A Yes. 11:03:26

Q Why would one use a Wiener filter as opposed to the filter multiplication approach shown in Figure 4? 11:03:28 11:03:32 11:03:36

A Why are you -- 11:03:36

MR. LENNIE: Objection. Form. 11:03:36

A I don't understand your question. "As 11:03:37

opposed to," that doesn't make sense to me. 11:03:40

Q What -- what's the advantage of a Wiener 11:03:43

filter over other types of filters? 11:03:46

A Are you speaking hypothetically and 11:03:49

generally? 11:03:51

Q Generally. In the art, in the field of 11:03:51

spectral subtraction and noise suppression, why would 11:03:55

one use a Wiener filter as opposed to some other type 11:03:57

of filter multiplication? 11:04:00

MR. LENNIE: Objection. Form. 11:04:02

A I -- I mean, speaking in the -- more 11:04:05

generally, a Wiener filter is designed to reduce noise 11:04:09

according to a specific criterion. It's simply a way 11:04:12

to design the filter. 11:04:15

Q Does it offer advantages over other types of 11:04:17

filters? 11:04:20

A It provides a method and specification for 11:04:24

setting filter coefficients. 11:04:28

Q Uh-huh. If you turn to column 8, line 52, 11:04:31

of the '345 patent? 11:04:35

A (Complying.) 11:04:37

Q The sentence beginning on line 52 reads, 11:04:41

"Although the straight forward approach may be used by 11:04:44

which phase is estimated and applied, the alternative 11:04:48

Wiener Filter is preferred since this saves processing 11:04:50

time and complexity." 11:04:54

Do you see that? 11:04:55

A I do. 11:04:56

Q Do you agree that the Wiener filter saves 11:04:57

processing time and complexity over the 11:04:59

straightforward approach? 11:05:01

A (Reviewing.) 11:05:36

So that the record is clear, the statement 11:05:56

"the straightforward approach" refers to the value of 11:05:58

the estimated bin noise magnitude is subtracted from 11:06:03

the current bin magnitude. 11:06:07

Q Uh-huh. 11:06:08

A The "alternative Wiener filter approach" is 11:06:11

referring to processing similar to block 400, because 11:06:16

this processing saves time and computation. 11:06:34

Q You agree that that processing saves time 11:06:37

and -- sorry, that process saves processing time and 11:06:42

complexity? 11:06:46

A It does save processing time and complexity. 11:06:48

Q Okay. Did the inventors of the '345 patent invent Wiener filters? 11:06:51 11:06:58

A Wiener filters were understood in the art for various applications in -- in tasks more generally. 11:07:02 11:07:05 11:07:09

Q Including spectral subtraction? 11:07:11

A The concept of a Wiener filter can be applied in many -- in many places. 11:07:24 11:07:26

Q Uh-huh. 11:07:29

A It was not something that was common within spectral subtraction to use. 11:07:30 11:07:33

Q Had it been used in spectral subtraction prior to '345? 11:07:35 11:07:37

A The methodology for the filter design had been used in techniques employing noise reduction. 11:07:47 11:07:49

THE WITNESS: Actually, could we take a break? Is that -- 11:08:09 11:08:10

MR. SWANSON: Yeah, sure. 11:08:11

THE WITNESS: I mean, I know you were -- 11:08:11

MR. SWANSON: No, we've been going for a 11:08:11

while, yeah. 11:08:13

THE WITNESS: Yeah, let's do it. 11:08:14

MR. SWANSON: That's fine, sure. 11:08:14

THE VIDEOGRAPHER: Going off the record. The time is 11:08. 11:08:15

(A recess was taken.) 11:20:42

THE VIDEOGRAPHER: Here begins Tape No. 2. We're back on the record 11:21. 11:20:47

(Mr. Haslam has rejoined the proceedings.) 11:20:51

BY MR. SWANSON: 11:20:52

Q Dr. Douglas, you said earlier that a Wiener filter is a filter that is designed to reduce noise according to a specific criterion. 11:20:56

Do you remember that? 11:21:03

A I do. 11:21:06

Q What is the specific criterion that you're referring to? 11:21:08

A So a Wiener filter is generally about trying to reduce noise. So the goal is to try to improve the quality of the signal relative to the noise. 11:21:13

Q Okay. And how does that relate to the specific criterion that you mentioned? 11:21:34

A Well -- 11:21:38
Q What would those criterion be? 11:21:38
A Well, one example criterion would be mean 11:21:41
squared error, as one possibility. 11:21:44
Q Anything else? 11:21:47
A There are other ones. One I recall is the 11:22:00
maximization of the signal-to-noise-ratio. 11:22:04
Q Do you recall any other examples? 11:22:11
A Not -- not right now, but there may be 11:22:13
others. There's different ways to formulate it. 11:22:15
Q Is any filter that reduces noise a Wiener 11:22:18
filter? 11:22:21
A No. Wiener filters, as I said, have been 11:22:26
designed according to criterion. 11:22:29
Q What differentiates a Wiener filter from a 11:22:34
non-Wiener filter? 11:22:38
A It's the design criterion. 11:22:41
Q Just turning back to Figure 4 of the '345 11:22:47
patent, the formula for H in block 402. 11:22:51
A Uh-huh. 11:23:02
Q Is H a Wiener filter? 11:23:02
MR. LENNIE: Objection. Form. 11:23:08

A H generally is a filter as part of a filter function. It can be computed in various ways. One of the ways in which this is -- this is an example of one way in which it's computed. 11:23:24 11:23:26 11:23:30 11:23:34

Q And is this example a Wiener filter? 11:23:35

A (Reviewing.) 11:23:37

It's one way of estimating a Wiener filter function. 11:23:39 11:24:55

Q How does -- how does this filter meet the specific criterion that you mentioned? 11:25:01 11:25:08

A (Reviewing.) 11:25:11

This particular function computes H(n) as a ratio of two quantities. The top quantity is the absolute value of a signal magnitude that's been noise reduced, and the bottom quantity is the signal magnitude. 11:26:44 11:26:49 11:26:57 11:27:03 11:27:07

And there is understanding within how Wiener filters work how that relates to Wiener filtering processing in general; although, this uses estimates of quantities to be able to compute it. 11:27:09 11:27:18 11:27:22 11:27:26

Q Uh-huh. How does this particular formula relate to Wiener filtering processing? 11:27:28 11:27:37

A I mean, one of the ways is that the way the ratio has been calculated and the fact the numerator and the denominator have been chosen the way they are. But it relates also to how the estimates are performed. 11:27:46 11:27:50 11:27:54 11:27:58 11:28:01

Q Can you turn back to Boll, please? And on Page 116 -- 11:28:06 11:28:30

A Uh-huh. 11:28:30

Q -- the formula we were looking at earlier -- 11:28:33

A Yes. 11:28:36

Q -- in the right-hand column. 11:28:36

Is the formula for H in Boll, is that a Wiener filter? 11:28:39 11:28:43

A No, it's not. 11:28:54

Q Why not? 11:28:56

A Well, one of the things that a Wiener filter generally has is that the filter function is greater than zero, and there's nothing in this that guarantees that. 11:29:00 11:29:03 11:29:07 11:29:10

Q That -- 11:29:17

A That's one of the ways. 11:29:18

Q Is there anything else? Any other reason 11:29:20

why it's not a Wiener filter? 11:29:21

A Well, there's the ways in which Mu K and XK are computed, I would have to look at how -- how he -- how he implements those. There's no -- it's not clear from his description that it is. 11:29:24 11:29:31 11:29:34 11:29:36

(Exhibit 5 was marked for identification and is attached to the transcript.) 11:29:38 11:29:38

Q Exhibit 5 is the Arslan prior art reference; is that right? 11:30:51 11:30:55

A Yes. 11:30:59

Q U.S. Patent 5,706,395, for the record. 11:31:00

A Yes. 11:31:06

Q You've seen this before? 11:31:08

A I have. 11:31:09

Q And you're familiar with Arslan? 11:31:11

A I am. 11:31:14

Q Does Arslan disclose a Wiener filter? 11:31:17

A Arslan talks about noncausal Wiener filtering which minimizes the mean squared error. 11:31:27 11:31:29

Q Turning back to the '345 patent, Exhibit 1, and just going back to the claims. 11:32:15 11:32:19

A Uh-huh. 11:32:36

Q So claim 15, do you see that? 11:32:40
A I do. 11:32:45
Q And claim 15 depends from claim 14; is that right? 11:32:46 11:32:49
A Yes. 11:32:51
Q The additional limitation of claim 15 is that the filter function of claim 14 is a Wiener filter function which is a function of said frequency bins of said noise elements and magnitude. 11:32:53 11:32:56 11:33:01 11:33:03
Is that right? 11:33:06
A That's what it says, yes. 11:33:07
Q If you assume that claim 14 is invalid, do you have an opinion as to whether the addition of the Wiener filter in claim 15 makes that claim patentable? 11:33:10 11:33:14 11:33:17
MR. LENNIE: Objection. Form. 11:33:23
A I haven't given thought to how, again, these hypothetical situations of things being invalid somehow allows me then to decide where systems that happen to use Wiener filters are also invalid. I haven't given that thought. That would take me more time to think through in this specific case. 11:34:09 11:34:16 11:34:18 11:34:21 11:34:25 11:34:28
Q Okay. Can you look at claim 16? Claim 16 11:34:30

depends from claim 15; is that right? 11:34:35

A Yes. 11:34:43

Q And claim 16 recites that the filter multiplication multiplies the complex elements of said frequency bins by said Wiener filter function? 11:34:44 11:34:51 11:34:54

A Yes. 11:34:57

Q If you assume that claim 15 is invalid, do you have an opinion as to whether the additional requirement of claim 16 makes that claim patentable? 11:35:03 11:35:06 11:35:10

MR. LENNIE: Objection. Form. 11:35:17

A Again, considering problems associated with claim dependence where you would say claim 16 depends upon 15 and 15 depends upon 14 and 14 depends upon 13 and you're claiming that things are invalid, I haven't given thought to these processes of what portion of, you know, the system is -- I mean, I would need more thought to think through this. 11:35:24 11:35:32 11:35:35 11:35:40 11:35:43 11:35:47 11:35:52

Q Okay. Are all of your opinions in this case based on the assumption that claim 1 is valid? 11:35:53 11:35:58

MR. LENNIE: Objection. Form. 11:36:03

A No, they're not. 11:36:06

Q Looking back at claim 16, was it known in 11:36:17

the art as of the time of the '345 patent that the way you would apply a Wiener filter to a signal is to multiply the complex elements by the filter? 11:36:22 11:36:26 11:36:30

MR. LENNIE: Objection. Form. 11:36:35

A I'm sorry, could you repeat the question? I want to make sure I get it right. 11:36:42 11:36:44

Q Uh-huh, yeah. 11:36:46

(Pending question read.) 11:36:46

A I mean, speaking more generally, a Wiener filter is implemented in different ways depending upon different systems, so ... (shrugging shoulders.) 11:37:21 11:37:24 11:37:27

The use of complex elements, I can't -- I guess I don't understand exactly what you're asking in terms of how it is that if someone would employ using a Wiener filter. 11:37:33 11:37:38 11:37:43 11:37:47

Certainly the statement Wiener filter would not -- would not imply that somebody is using complex elements. Necessarily. 11:37:48 11:37:50 11:37:54

Q But that's one way you could do it? 11:37:59

A There are different ways to implement filters. 11:38:03 11:38:05

Q Uh-huh. 11:38:06

A Employing complex processing is a way to implement a filter. 11:38:07 11:38:11

Q And that was known prior to the '345 patent? 11:38:12

A What do you mean by "it"? 11:38:17

Q You said, "Employing complex processing is a way to implement a filter." 11:38:20 11:38:24

A Yes. Employing complex processing is a way to implement a filter was something that was known, yes. 11:38:25 11:38:28 11:38:31

Q Okay. And by "employing complex processing," do you mean that the filter would be applied by multiplying the filter against the complex elements of a signal? 11:38:31 11:38:33 11:38:35 11:38:39

A That's one way to perform the resulting calculation. 11:38:40 11:38:43

Q Okay. Let's look at claim 17. Claim 17 depends from claim 13, right? 11:38:44 11:38:58

A Uh-huh. 11:39:03

Q And claim 17 recites the additional limitation of a residual noise processor for reducing residual noise remaining after said subtractor subtracts that noise elements at said positions 11:39:03 11:39:07 11:39:12 11:39:15

determined by -- sorry -- determined by said threshold detector from said audio signal. 11:39:18 11:39:22

Do you see that? 11:39:26

A I do. 11:39:27

Q And I believe you said earlier that residual noise processing was known in the art as of the time of the '345 patent? 11:39:29 11:39:33 11:39:36

A There were techniques for performing residual noise processing on -- on signals after they had been processed. 11:39:42 11:39:44 11:39:50

Q And in fact, Boll discloses a technique for performing residual noise -- 11:39:51 11:39:54

A Boll has a specific technique that he has described for this. 11:39:56 11:39:59

Q For residual noise processing? 11:40:00

A For residual noise processing, yes. 11:40:01

Q Are you familiar with the concept of residual noise processing? 11:40:08 11:40:11

A Yes, I'm familiar with the general concept of it. I haven't been using it or practicing it in terms of implementing such systems. 11:40:17 11:40:20 11:40:24

Q Is the purpose of residual noise processing 11:40:27

to reduce the artifacts that remain after spectral subtraction? 11:40:29 11:40:33

A I mean -- can you give me a little more context? 11:40:37 11:40:44

Q Do you have an understanding that after spectral subtraction is performed that there can be noise artifacts remaining in the signal? Is that right? 11:40:47 11:40:52 11:40:55 11:40:58

A There can be noise remaining in the signal, yes. 11:40:59 11:41:02

Q And is the purpose of residual noise processing to reduce some of that remaining noise? 11:41:02 11:41:05

A Yes. The purpose of residual is -- the concept -- the term "residual" refers to the idea that you wish to further reduce the resulting, you know, undesirable components within the signal after you've done your initial filtering. 11:41:10 11:41:13 11:41:17 11:41:23 11:41:28

Q And that was known at the time of the '345 patent? 11:41:30 11:41:32

A Aspects of it were described in Boll in specific ways. 11:41:34 11:41:36

Q The '345 inventors didn't invent residual 11:41:38

noise processing, right? 11:41:44

MR. LENNIE: Objection. Form. 11:41:49

A The '345 patent contains many different elements which comprise it. Those elements, put together, yield the resulting system. A residual noise processing is one of those aspects. 11:41:44 11:42:01 11:42:04 11:42:08 11:42:14

Q Was there anything novel about the way the '345 patent performs residual noise processing? 11:42:17 11:42:19

MR. LENNIE: Objection. Form. 11:42:23

A Again, I'm not here to try to determine the novelty of that particular residual noise processing. My report rebuts the opinions of Dr. Kyriakakis in terms of his determination of elements of the '345 patent. And other aspects. 11:42:34 11:42:36 11:42:42 11:42:46 11:42:50

Q Uh-huh. Does that mean you don't know if there was anything novel about the way the '345 patent performs residual noise processing? 11:42:53 11:43:01 11:43:04

MR. LENNIE: Objection. Form. 11:43:06

A Again, the '345 contains combinations of different elements which include residual noise processing. So the design of the '345 system as one of its embodiments would allow residual noise 11:43:38 11:43:41 11:43:44 11:43:52

processing to be part of it. 11:43:57

Q But I'm -- I'm focusing just on the residual noise processing element of the '345 patent. 11:43:59 11:44:03

Was there anything novel about their technique for residual noise processing? 11:44:06 11:44:08

MR. LENNIE: Objection. Form. 11:44:17

A (Reviewing.) 11:44:18

The '345 describes methods for performing residual noise reduction in both Figure 5 and Figure 5A, and Figure 5A employees a similar threshold used by the noise estimator at 508 on the noise-free output bin. So it uses thresholds and methods for estimating thresholds. 11:46:32 11:48:01 11:48:04 11:48:10 11:48:15 11:48:22

Q And is there anything novel about that? 11:48:26

MR. LENNIE: Objection. Form. 11:48:29

A Again, the mechanism for estimating thresholds and the mechanisms for performing that noise processing are part of the '345 patent, and those combinations yield results which are -- have -- are indicative of, you know, system -- the system that is being described in the '345 embodiment. 11:48:38 11:48:43 11:48:46 11:48:50 11:48:56 11:49:03

Q And is that novel, in your view, a novel way 11:49:13

of performing residual noise reduction? 11:49:18

MR. LENNIE: Objection. Form. 11:49:21

A I mean, again, my purpose here is -- is to provide opinions on rebuttal of Dr. Kyriakakis's report. You know, '345 contains combinations of systems which allow it to be a novel invention. 11:49:22 11:49:26 11:49:32 11:49:42

Q You consider yourself an expert in the area of signal processing? 11:49:45 11:49:50

A I do. 11:49:53

Q You consider yourself an expert in the area of noise cancellation? 11:49:54 11:49:56

A I've worked in noise cancellation and systems that reduce noise, yes. 11:49:58 11:50:00

Q Do you -- that's a yes? You consider yourself an expert in noise cancellation? 11:50:02 11:50:05

A In systems that reduce noise. 11:50:07

Q And you've been working in the field for 25 years? 11:50:10 11:50:12

A I -- so I've been working in the field of signal processing and various aspects of -- of, you know, the processing of audio signals in particular. 11:50:13 11:50:16 11:50:19

Q For more than 25 years? 11:50:23

A Yes. 11:50:25
Q And you've been a professor since 1998? 11:50:26
A Actually, I've been a processor since 1992. 11:50:30
Q Oh. So more than -- I guess that's 25 11:50:34
years? 11:50:37
A Yes. 11:50:38
Q Okay. And that was before the '345 patent 11:50:38
was filed? 11:50:41
A Yes. 11:50:42
Q Okay. So based on those 25 years of 11:50:43
experience in the area of signal processing and noise 11:50:48
cancellation, do you have an opinion as to whether the 11:50:51
techniques described in the '345 patent for residual 11:50:56
noise processing were novel? 11:50:59
MR. LENNIE: Objection. Form. 11:51:02
A Again, I'm here to provide rebuttal on the 11:51:04
opinions that have been provided by Dr. Kyriakakis 11:51:09
that he has raised in his report. 11:51:12
Q So the answer is no, you don't have an 11:51:14
opinion? 11:51:16
MR. LENNIE: Objection. Form. 11:51:17
A Again, my -- I am here to provide opinions 11:51:22

on the opinions that have been provided by the other expert in his report. 11:51:25 11:51:30

Q Okay. So you don't have an opinion on that issue? 11:51:32 11:51:34

MR. LENNIE: Objection. Form. 11:51:35

A Again, what makes the patent -- what makes the patent novel is the combination of its elements that allow the various different aspects of the system to function in conjunction and that overall aspect of the system made the system unique. 11:51:58 11:52:03 11:52:06 11:52:09 11:52:14

Q But sitting here today you're not able to say whether or not the noise -- the residual noise reduction techniques in the '345 patent were novel? 11:52:18 11:52:20 11:52:23

MR. LENNIE: Objection. Form. 11:52:27

A Again, the residual noise reduction techniques use noise estimation processes and threshold processes which are important features and unique features of '345 patent. 11:52:33 11:52:38 11:52:41 11:52:45

Q Were those techniques novel as of the time of the '345 patent? The residual noise reduction techniques? 11:52:52 11:52:55 11:53:00

A The methodologies that were used in 11:53:01

combination were, yes. 11:53:04

Q When you say "in combination," you mean in combination with everything else in the patent? 11:53:08 11:53:11

MR. LENNIE: Objection. Form. 11:53:13

A I mean -- again, aspects of -- the patent describes an embodiment which combines the resulting elements. 11:53:14 11:53:22 11:53:25

Q Was there anything novel about the technique for Wiener filtering described in the patent? 11:53:31 11:53:34

MR. LENNIE: Objection. Form. 11:53:38

A (Reviewing.) 11:53:54

Again, methodologies for performing the noise estimation process and for detecting positions of noise elements in order to do computations are an important feature of the patent and novel in the patent. 11:54:05 11:54:08 11:54:11 11:54:15 11:54:19

Q So your opinion is that the novelty was the way in which noise was estimated and detected? 11:54:21 11:54:24

MR. LENNIE: Objection. Form. 11:54:31

A It's not the only novelty, no. 11:54:32

Q What are the other novelties? 11:54:34

A The way the system is combined together and 11:54:37

the way the aspects and, in fact, the way the inventors considered the various different aspects to be combined is an important aspect of its novelty. 11:54:40 11:54:43 11:54:46

Q So it's the combination of noise estimation and noise detection along with the other features like Wiener filters and residual noise processing, not those features on their own? 11:54:50 11:54:52 11:54:57 11:55:01

A It -- 11:55:03

MR. LENNIE: Objection. Form. 11:55:04

A (Reviewing.) 11:55:05

Again, the methodologies for how the system performs its computation is novel and in addition to allowing the other methods to be combined with it. 11:55:35 11:55:37 11:55:43

Q What do you mean? What computation are you referring to? 11:55:48 11:55:51

A For example, a threshold detector for setting a threshold for each frequency bin using a noise estimation process and for detecting for each frequency bin whether the magnitude of the frequency bin is less than the corresponding threshold, thereby detecting the position of noise elements for each frequency bin. That's an example. 11:55:54 11:55:55 11:55:59 11:56:02 11:56:05 11:56:07 11:56:10

Q Was the computation of the Wiener filter novel? 11:56:13 11:56:15

A The way in which values are used to calculate the Wiener filter function -- sorry. The way in which the values are computed within the Wiener filter function certainly bring it novelty. 11:56:20 11:56:23 11:56:27 11:56:30

Q Aside from how the variables themselves were calculated, is the calculation for the Wiener filter novel? 11:56:33 11:56:36 11:56:39

A I mean, it used also aspects of full-wave rectification as mentioned, as an example. 11:56:41 11:56:44

Q Are you saying that full-wave rectification was novel? 11:57:01 11:57:05

MR. LENNIE: Objection. Form. 11:57:10

A Again, when used with the techniques within the patent to be able to perform the computation, it provided -- it provided a -- a capable and novel system. 11:57:12 11:57:17 11:57:23 11:57:27

Q You're talking about the noise estimation techniques? 11:57:28 11:57:30

A For example. 11:57:31

Q Okay. But you're not saying that the Wiener 11:57:32

filter calculation itself was novel? 11:57:34

MR. LENNIE: Objection. Form. 11:57:39

A The concept and knowledge of a Wiener filter was known. The methodologies of how to apply it can be unique in various situations. And depending upon the situation, those -- those evaluations can be different. 11:57:59 11:58:01 11:58:04 11:58:08 11:58:13

Q Was it unique in this patent, the way in which it was applied? 11:58:15 11:58:19

A Yes. 11:58:20

Q How so? 11:58:21

A Because it used computations of both noise estimation and processing to allow the system to -- to effectively yield an accurate estimation of the output. 11:58:22 11:58:28 11:58:35 11:58:39

Q Okay. Turning back to the claims. Claim 17. 11:58:42 11:58:49

A Uh-huh. 11:58:52

Q Assuming -- so claim 17 depends from claim 13; is that right? 11:58:55 11:58:59

A It does. 11:59:01

Q Okay. Assuming that claim 13 is invalid, do 11:59:02

you have an opinion as to whether the additional limitation of claim 17 makes that claim patentable over claim 13? 11:59:06 11:59:08 11:59:11

A Claim 17 refers to said positions and said threshold detector and these described techniques within the '345 patent for setting a threshold for each frequency bin using a noise estimation process and for detecting positions of noise elements. 12:00:42 12:00:45 12:00:48 12:00:56 12:01:00

So there are features in this which are pointing towards elements within '345 that have -- that yield functionality for the overall patent. 12:01:02 12:01:07 12:01:15

Q You're talking about what's described in the specification? 12:01:20 12:01:23

A That's one -- 12:01:24

Q [Inaudible.] 12:01:25

A That's one instantiation of that, yes. 12:01:26

Q Is it your opinion that what's described in the specification for setting a threshold and detecting a position of noise elements is required by the threshold detector limitation in claim 1? 12:01:28 12:01:30 12:01:32 12:01:35

A It's not -- 12:01:37

MR. LENNIE: Objection. Form. 12:01:38

A It's not required; it is an example embodiment for the system. 12:01:39 12:01:41

Q Uh-huh. But the claim isn't limited to that? 12:01:44 12:01:46

A The claim is not limited to that example embodiment, no. 12:01:48 12:01:51

Q Okay. So going back to my question, then, about claim 17, do you have an opinion -- if you assume claim 13 is invalid, do you have an opinion as to whether the additional limitation of claim 17 makes it patentable over claim 13? 12:01:52 12:01:54 12:01:58 12:02:01 12:02:05

MR. LENNIE: Objection. Form. 12:02:08

A Again, I haven't gone through the thought process of trying to determine where -- you know, if these items are invalid, how this aspect of the system would be. 12:02:43 12:02:45 12:02:48 12:02:54

Q Okay. Looking at -- 12:02:55

A Decided. 12:02:58

Q Sorry? 12:02:59

A Decided. I said decided. 12:03:00

Q Okay. Looking at claim 18, claim 18 depends on claim 17, right? 12:03:01 12:03:06

A Yes. 12:03:09

Q And the additional limitation of claim 18 is that said residual noise processor replaces said frequency bins corresponding to non-speech segments of said audio signal with a minimum value. 12:03:11 12:03:15 12:03:19 12:03:22

Is that right? 12:03:26

A It says that, yes. 12:03:27

Q Assuming claim 17 is invalid, do you have an opinion as to whether the additional limitation of claim 18 makes that claim patentable over claim 17? 12:03:29 12:03:33 12:03:35

MR. LENNIE: Objection. Form. 12:03:40

A (Reviewing.) 12:03:47

Again, I haven't considered that issue with regard to my -- my response in my rebuttal report, and I haven't gone through the thought processes of trying to take out portions of the system's -- of the validity of this to try to determine that. 12:04:15 12:04:17 12:04:25 12:04:29 12:04:30

Q Okay. Let's take a look at claim 21. Claim 21 refers to an estimator for estimating a magnitude of each frequency bin? 12:04:33 12:04:41 12:04:45

A Uh-huh. 12:04:47

Q Do you see that? 12:04:47

A I do. 12:04:48
Q Is that referring to the step in the 12:04:53
patent -- why don't we look at Figure 2 of the patent? 12:05:01
A (Complying.) 12:05:07
Q Is that referring to what's shown in Figure 12:05:16
204? Sorry, box 204 of Figure 2? 12:05:19
A (Reviewing.) 12:05:25
Box 204, Figure 2, describes an example of 12:05:46
an estimate of the magnitude of a frequency bin. 12:05:50
Q And that would be done instead of 12:05:58
calculating magnitude exactly, right? 12:06:01
MR. LENNIE: Objection. Form. 12:06:06
A (Reviewing.) 12:06:07
This is a method for estimating the 12:06:16
magnitude of a frequency bin. 12:06:20
Q And is the purpose of that to avoid the 12:06:25
complexity of calculating magnitude precisely? 12:06:30
MR. LENNIE: Objection to form. 12:06:34
A Are you speaking of this particular 12:06:37
calculation or are you speaking of in general methods 12:06:41
for estimating magnitude? 12:06:45
Q In general. 12:06:48

A In general, I mean the purpose of estimating magnitude is to try to determine the size of a signal, and there are many ways to do it. This is an example of one way. 12:06:49 12:06:52 12:06:56 12:06:59

Q You can calculate magnitude exactly, right? 12:07:01

MR. LENNIE: Objection. Form. 12:07:05

A The magnitude is the size of a signal. 12:07:17

Q Uh-huh. 12:07:20

A It involves a decision as to what that size is and then methods to estimate the magnitude attempt to come to values that are close in some sense to that. 12:07:20 12:07:24 12:07:30 12:07:33

Q Is there a mathematical formula for calculating magnitude? 12:07:36 12:07:39

Let me be more precise. Is there a formula for calculating magnitude based on the output of a FFT? 12:07:50 12:07:52 12:07:58

MR. LENNIE: Objection. Form. 12:08:00

A (Reviewing.) 12:09:31

For an FFT, the values that are computed can be complex in value. In such contexts, the values can be represented using an amplitude and a phase for a 12:11:38 12:11:42 12:11:49

complex number. And the magnitude calculation can be used to find the amplitude of that complex number. 12:11:55 12:12:00

Q And is the formula for that magnitude calculation shown in column 5, line 39, recognizing there is a mistake in that formula and that the exponent should be one-half instead of negative 2? 12:12:06 12:12:11 12:12:18 12:12:22

A That is a way to compute the amplitude of a complex number. 12:12:30 12:12:33

Q And then immediately after that formula it's -- the patent says, "In order to save processing time and complexity the signal magnitude is estimated by an estimator using an approximation formula instead." 12:12:36 12:12:43 12:12:45 12:12:49 12:12:52

Do you see that? 12:12:52

A I see the passage that you're pointing to. 12:12:54

Q Okay. And then following that there is a -- another formula? Do you see that? 12:12:58 12:13:01

A Yes, I do. 12:13:05

Q And that's a formula for approximating magnitude? 12:13:06 12:13:11

A That's an estimator of the magnitude. 12:13:13

Q And do you agree that one reason why you 12:13:18

would estimate magnitude instead of using the formula above is to save processing time and complexity? 12:13:22 12:13:27

A There are different ways -- or different reasons, I should say -- for using estimation processes. One of those is to reduce complexity. 12:13:35 12:13:38 12:13:42

Q Did the inventors of the '345 patent invent this technique for estimating magnitude? 12:13:52 12:13:57

MR. LENNIE: Objection. Form. 12:14:02

A I haven't been asked to yield an opinion on whether this particular technique was invented. 12:14:17 12:14:19

Q Was the magnitude calculation shown at column 5, line 39, was that known in the art as of the time of the '345? 12:14:25 12:14:32 12:14:37

A Versions of that equation were -- were known with regard to calculations used with complex processing. This system purports to use it in the context of noise estimation. 12:14:54 12:15:04 12:15:09 12:15:13

Q Had this formula been used in the context of noise estimation before the '345? 12:15:20 12:15:22

MR. LENNIE: Objection. Form. 12:15:26

A I -- I don't know how I could know that. I don't have access to all the systems that have ever 12:15:27 12:15:30

been designed prior to this to try to figure that out. 12:15:33

Q Did Boll calculate the magnitude of signals? 12:15:37

MR. LENNIE: Objection. Form. 12:15:47

A Boll uses the absolute value of signal quantities in his calculations. 12:15:50 12:15:55

Q And is that a calculation of magnitude? 12:15:58

MR. LENNIE: Objection. Form. 12:16:05

A It is a representation of amplitude. Magnitude is a calculation designed to get at that. 12:16:08 12:16:11

Q Is it -- when you say it's a representation, do you mean it's an estimation of amplitude or is it an exact calculation of amplitude? 12:16:15 12:16:19 12:16:22

MR. LENNIE: Objection. Form. 12:16:25

A I don't understand what you mean in your question. 12:16:33 12:16:36

Q What did you mean by "it's a representation of amplitude"? 12:16:36 12:16:38

A Absolute value is one way to represent the amplitude of a complex number and the way to essentially look at the length of the complex vector in real and imaginary space. 12:16:47 12:16:52 12:16:57 12:17:01

Q At the time of the '345 patent, were -- was 12:17:05

it known to use approximation formulas for magnitude rather than calculating magnitude exactly? 12:17:11 12:17:16

MR. LENNIE: Objection. Form. 12:17:27

A (Reviewing.) 12:18:11

There were methods for approximating the exact calculation of the magnitude of quadrature components. 12:18:14 12:19:08 12:19:12

Q And just for the record, you were looking back at your report; is that right? 12:19:12 12:19:14

A Yes, I was. I wanted to make sure that what I said was consistent with it. I was aware of methods, but I wanted to be sure that my wording was precise. 12:19:16 12:19:19 12:19:23 12:19:26

Q Okay. And do those methods include estimating -- 12:19:27 12:19:32

THE COURT REPORTER: I'm sorry, I lost you. 12:19:32

MR. SWANSON: Sorry. 12:19:32

THE COURT REPORTER: Go ahead. That was my fault. 12:19:32 12:19:32

MR. SWANSON: Sure, no, no problem. 12:19:32

Q Did those methods include -- did those methods include estimating magnitude as a function of 12:19:41 12:19:47

the maximum and minimum values of the complex element of an FFT? 12:19:50 12:19:54

MR. LENNIE: Objection. Form. 12:19:57

A With regard to an FFT, I -- no, I'm not -- I'm not considering situations where frequency domain processing was -- was being done. 12:20:05 12:20:11 12:20:14

Q Uh-huh. What about just using the maximum/minimum values of complex numbers generally? 12:20:17 12:20:19

A That -- that was known, yes. 12:20:22

Q Looking back at the claims again of the '345, claim 21. 12:20:26 12:20:30

A Uh-huh. 12:20:32

Q Claim 21 depends on claim 1? 12:20:32

A Yes. 12:20:39

Q Correct? 12:20:40

And claim 21 adds the limitation of an estimator for estimating a magnitude of each frequency bin; is that right? 12:20:44 12:20:47 12:20:50

A Yes. 12:20:52

Q Assuming claim 1 is invalid, do you have an opinion as to whether the additional limitation of claim 21 makes it patentable over claim 1? 12:20:52 12:20:55 12:21:00

MR. LENNIE: Objection to form. 12:21:04

A I wasn't considering scenarios where claim 1 was somehow invalid, and looking at claim 21, the focus is on estimator for estimating a magnitude of each frequency bin. 12:22:48 12:22:51 12:22:57 12:23:00

This is a technique which is something that -- you know, estimating a magnitude of each frequency bin depends upon a particular application, so it's hard to know from that aspect exactly what feature we're talking about in terms of what's valid or invalid. 12:23:02 12:23:04 12:23:11 12:23:16 12:23:20 12:23:23

Q Are you saying you don't understand claim 21? 12:23:25 12:23:27

MR. LENNIE: Objection. Form. 12:23:29

A I understand what an estimator for estimating a magnitude of each frequency bin is in the general context of these -- of -- of this system. 12:23:41 12:23:42 12:23:46

Q All right. So going back to my question, do you have an opinion as to whether if you assume claim 1 is invalid the additional limitation of claim 21 make its patentable over claim 21? 12:23:49 12:23:53 12:23:57 12:24:01

MR. LENNIE: Objection. Form. 12:24:08

A Again, there are systems that use processing involving magnitudes. Speaking -- and this is a hypothetical that's hard to put my head around in terms of what it is that you're asking me to do. 12:24:15 12:24:18 12:24:23 12:24:26

Q Okay. So you have no opinion on that issue sitting here today? 12:24:31 12:24:34

A I would have to give additional thought to it. 12:24:37 12:24:39

Q Okay. And looking at claim 22, claim 22 depends from claim 21, right? 12:24:40 12:24:44

A Yes. 12:24:49

Q And claim 22 adds the limitation of said estimator estimates said magnitude of each frequency bin as a function of the maximum and the minimum values of the complex element of said frequency bins for a number n of frequency bins. 12:24:50 12:24:55 12:25:00 12:25:03 12:25:07

A Sure. 12:25:12

Q Assuming claim 21 is invalid, do you have an opinion as to whether the additional limitation of claim 22 makes it patentable over claim 21? 12:25:14 12:25:17 12:25:20

MR. LENNIE: Objection. Form. 12:25:24

A (Reviewing.) 12:26:55

A system which estimates said magnitude of each frequency bin as a function of the maximum/minimum values of the complex elements of said frequency bins for a number n of frequency bins describes frequency domain processing. 12:28:48 12:28:51 12:28:53 12:28:56 12:29:00

Q Uh-huh. 12:29:02

A I'm aware of methods for performing calculations using maximum and minimum values as estimators. The context of this sort of processing depends, though, on the overall context of the patent and also of the system for which the methods are being used. 12:29:06 12:29:09 12:29:13 12:29:16 12:29:20 12:29:24

Q So is that a yes, you do have an opinion or no, you don't have an opinion on that? 12:29:29 12:29:33

A I -- it's an issue which I can't address without -- I mean, if you're simply saying, you know, a system which has just this feature, I mean it's in combination with these other features which allows the system to be able to -- to function. 12:29:34 12:29:37 12:29:42 12:29:47 12:29:49

So, you know, I -- I -- I've been asked to render -- to look at issues related to the entire patent, not to that specific one issue. 12:29:53 12:30:01 12:30:04

Q All right. And just to be clear, I mean my question is, if you assume that claim 21 was either that the apparatus of claim 21 was either anticipated or obvious over the prior art, do you have an opinion as to whether the additional feature recited in claim 22 would make that claim patentable over the apparatus of claim 21? 12:30:06 12:30:13 12:30:18 12:30:22 12:30:26 12:30:30 12:30:36

A Well -- 12:30:36

MR. LENNIE: Objection. Objection. Form. 12:30:38

A Well, but the apparatus of 21 depends upon claim 1. 12:30:39 12:30:43

Q Right. 12:30:44

A So it certainly could potentially be patentable because of claim 1. 12:30:45 12:30:49

Q But if you assume -- so you understand that claim 21 includes the limitations of claim 1, right? 12:30:51 12:30:53

A Yes. 12:30:57

Q Okay. So if the apparatus of claim 21, including all the limitations of claim 1, was anticipated or obvious over the prior art, you have no opinion as to whether the additional limitation of claim 22 makes that claim patentable over the 12:30:58 12:31:00 12:31:05 12:31:10 12:31:13

apparatus of claim 21? 12:31:17

MR. LENNIE: Objection. Form. 12:31:19

A Again, I haven't been asked to consider claim 22 in isolation without considering claim 1 -- or claim 21 as well as back to claim 1. 12:31:20 12:31:23 12:31:26

Q All right. What about claim 23? Claim 23 depends on claim 21, right? 12:31:30 12:31:35

A Yes. 12:31:39

Q And claim 21 adds the additional element of a smoothing unit which smooths the estimate of each frequency bin; is that right? 12:31:39 12:31:44 12:31:49

A That's -- 12:31:51

MR. LENNIE: Objection. Form. 12:31:54

A The apparatus, according to claim 21, further comprising a smoothing unit which smooths the estimate of each frequency bin is what the claim states. 12:31:55 12:31:56 12:31:59 12:32:02

Q And if you again assume that the apparatus of claim 21 is anticipated or obvious over the prior art, do you have an opinion as to whether the additional limitation of claim 23 makes that claim patentable over the apparatus of claim 21? 12:32:04 12:32:08 12:32:15 12:32:17 12:32:22

MR. LENNIE: Objection. Form. 12:32:33

A (Reviewing.) 12:32:34

Again, the language of this claim is in -- 12:35:23

is written in the context of the patent, where the 12:35:26

patent describes a smoothing unit which smooths the 12:35:29

estimate of each frequency bin. 12:35:32

And I -- I don't understand how I'm supposed 12:35:34

to consider this smoothing unit in the context of that 12:35:38

without considering the entire system. 12:35:41

Q What's your understanding of what claim 23 12:35:46

requires? 12:35:50

A Well, it comprises a smoothing unit, and it 12:36:00

smooths the estimate of each frequency bin, so it's a 12:36:03

system which employs some form of smoothing and/or 12:36:07

averaging. 12:36:10

Q And can that be smoothing or averaging over 12:36:11

time? 12:36:13

A It can be smoothing and averaging over time 12:36:17

and over frequency. 12:36:19

Q Okay. Do you understand claim 23 to require 12:36:28

any specific type of smoothing or averaging? 12:36:34

A Can you be more specific? 12:36:43

Q Well, I was just going back to your answer a moment ago about the -- you said you don't know how you're supposed to consider the smoothing unit of claim 23 without considering the entire system, and I was just wondering if -- if you were saying that claim 23 requires some specific type of smoothing described in the patent? 12:36:45 12:36:48 12:36:52 12:36:56 12:37:01 12:37:04 12:37:08

A It doesn't require a specific type of smoothing. 12:37:09 12:37:11

Q Okay. So going back to my question, then, if you assume that the apparatus of claim 21 was anticipated or obvious over the prior art, do you have an opinion as to whether the additional limitation in claim 23 makes that claim patentable over the apparatus of claim 21? 12:37:11 12:37:17 12:37:22 12:37:25 12:37:28 12:37:33

MR. LENNIE: Objection. Form. 12:37:36

A Again, I've considered all aspects of the patent, including the various claims and those that -- those independent claims that depend on the claim that we're talking about. 12:37:39 12:39:10 12:39:16 12:39:22

If you take away 1 and 21 and 22 and we're left with 23, this is the only claim we have, there 12:39:26 12:39:31

are systems that perform smoothing, but I don't understand how I'm supposed to judge patentability of things when you take away all of these other aspects. 12:39:35 12:39:40 12:39:44

Q By "systems that perform smoothing" you mean prior art systems that perform smoothing? 12:39:49 12:39:52

A I mean the concept of smoothing in general and the -- and yes, systems that would calculate smoothing. 12:39:55 12:39:58 12:40:02

Q Were part of the prior art? 12:40:03

MR. LENNIE: Objection. Form. 12:40:08

A There are methods that smooth quantities having to do with things that -- calculations that occur. This is speaking to smoothing which smooths estimates of frequency bins with respect to this application. So this is pointing to a type of smoothing within -- within the operation of the patent. 12:40:10 12:40:12 12:40:17 12:40:23 12:40:27 12:40:31 12:40:33

Q Does Boll disclose smoothing of frequency bins? 12:40:35 12:40:38

A (Reviewing.) 12:40:53

Q Let me point you specifically to Page 116 of Boll. 12:42:07 12:42:10

A Uh-huh. Yes. 12:42:11
Q The right-hand column? 12:42:12
A Yes. 12:42:14
Q The very top of that column has a heading that says "Magnitude Averaging"? 12:42:14
A Yes. 12:42:17
Q Is that talking about smoothing? 12:42:19
A It is talking about smoothing. 12:42:19
Q Okay. And -- 12:42:21
A It is not describing smoothing in frequency, no. 12:42:23
Q It's talking about smoothing over time? 12:42:30
A It's talking -- 12:42:33
(Reviewing.) 12:42:34
"... the variance of the noise spectral estimate is reduced by averaging over as many spectral magnitude sets as possible," where "sets" refers to different points in time. 12:42:36
Q Right. Okay. So you haven't had a chance to consider whether the additional limitation of claim 23 makes that claim patentable over claim 21? 12:42:38
MR. LENNIE: Objection. Form. 12:42:39
12:42:44
12:42:47
12:42:52
12:42:55
12:42:58
12:43:01
12:43:06

A (Reviewing.) 12:43:19

Again, I haven't been asked to consider 23 12:43:20
in isolation to determine whether it's patentable or 12:44:46
not. The system I've been looking at is the system of 12:44:50
the '345 which includes many elements. 12:44:54

Q Okay. Just turning to claim 25 on the next 12:44:59
page. 12:45:04

A (Complying.) 12:45:05

Q Claim 25 depends from claim 1, right? 12:45:08

A Yes. 12:45:11

Q And claim 25 adds the limitation of an 12:45:13
adaptive array comprising a plurality of microphones 12:45:16
for receiving said audio signal? 12:45:20

A Yes. 12:45:23

Q Assuming claim 1 is invalid, do you have an 12:45:25
opinion as to whether the additional limitation of 12:45:29
claim 25 makes it patentable over claim 1? 12:45:31

MR. LENNIE: Objection. Form. 12:45:35

A (Reviewing.) 12:46:26

Can we be more specific about what it is 12:46:26
that you're talking about in claim 25 in terms of the 12:47:12
terms that you're asking about? 12:47:15

Q Do you not understand claim 25? 12:47:18

A I understand an adaptive -- what an adaptive array is. 12:47:22 12:47:27

Q Is there something else you don't understand in claim 25 or -- 12:47:28 12:47:30

A Well, I guess -- you're asking me the question of trying to separate claim 25 from claim 1. I'm -- I'm -- I'm trying to navigate that question. 12:47:32 12:47:34 12:47:37

Q Uh-huh. What I'm asking is if the -- claim 1 describes an apparatus for canceling noise, right? 12:47:41 12:47:45

A That's one -- yes, that's how it starts, yes. 12:47:49 12:47:52

Q Okay. If you assume that the apparatus covered by claim 1 -- 12:47:53 12:47:57

A Right. 12:47:59

Q -- was already in the prior art as of the time of the '345 patent, does the addition of an adaptive array comprising a plurality of microphones for receiving said audio signal represent a novel and nonobvious variation on the apparatus of claim 1? 12:47:59 12:48:02 12:48:07 12:48:12 12:48:16

MR. LENNIE: Objection. Form. 12:48:20

A But how is it -- how are we talking about a 12:48:22

nonobvious variation of something that's already -- I'm -- I'm trying to understand what it is that you're asking me to -- to ... 12:48:26 12:48:29 12:48:32

Q Do you have an understanding that claim 25 narrows claim 1, it adds -- 12:48:34 12:48:37

A Yes. 12:48:39

Q -- a limitation to claim 1, right? 12:48:39

A Yes. 12:48:41

Q And you have an understanding of what that limitation is? 12:48:42 12:48:44

A Yes. 12:48:45

Q That's the adaptive array comprising a plurality -- 12:48:45 12:48:46

A Yes. 12:48:46

Q -- of microphones? 12:48:46

A It is using it in here as an adaptive array, yes. 12:48:50 12:48:52

Q So if you assume that what's described in claim 1 was in the prior art, would the addition of an adaptive array with a plurality of microphones be a novel or nonobvious addition to that apparatus? 12:48:53 12:48:55 12:48:58 12:49:03

MR. LENNIE: Objection. Form. 12:49:08

A An adaptive array is a system that comprises many parts to it. It can have many different features. 12:52:03 12:52:06 12:52:09

Again, this problem of trying to determine whether, you know, an adaptive array is patentable based off of an invalidity -- or the statement about whether the first element is -- in claim 1 is obvious or not is something I haven't been asked to opine upon. 12:52:12 12:52:17 12:52:22 12:52:25 12:52:29 12:52:32

Q All right. 12:52:33

MR. LENNIE: Be a good time to break for lunch? 12:52:40 12:52:41

THE WITNESS: Yeah, I think it's a good time to break, if that's okay. 12:52:42 12:52:43

THE VIDEOGRAPHER: Going off the record. The time is 12:52. 12:52:45 12:52:46

(A recess was taken.) 12:52:48

AFTERNOON SESSION 12:52:48

(Exhibit 6 was marked for identification and is attached to the transcript.) 13:35:32 13:35:32

THE VIDEOGRAPHER: Here begins Tape No. 3. We're back on the record at 1:36. 13:36:02 13:36:03

BY MR. SWANSON: 13:36:06

Q Good afternoon. 13:36:06

A Good afternoon. 13:36:07

Q I've just handed you what's been marked as Exhibit 6. Is this a copy of your report in this case? 13:36:09 13:36:11 13:36:14

A Yes. 13:36:15

Q Okay. How was your report prepared? 13:36:16

A I wrote my report and I wrote it with -- with consideration given to me from legal help, because I'm not a lawyer. 13:36:29 13:36:33 13:36:45

I developed technical opinions on aspects of technology related to the matter at hand. 13:36:48 13:36:52

(Mr. Haslam joined the proceedings.) 13:37:03

A I worked with the legal assistants that I had to be able to, you know, take a shell in terms of an overall structure of -- of the document and I, along with help, populated portions of this which allows me to in- -- to put in my technical opinions and also address legal considerations which are -- which are important with respect to this matter. 13:37:07 13:37:14 13:37:19 13:37:24 13:37:28 13:37:32 13:37:37

Q When you say you wrote the report, did you 13:37:40

write everything in the report? 13:37:42

A As I said, there was a shell document that 13:37:44

we started with -- 13:37:47

Q Uh-huh. 13:37:48

A -- and that helped me understand the basic 13:37:48

structure that is appropriate for a report of this 13:37:51

type. 13:37:55

With regard to the technical opinions, those 13:37:56

opinions are ones that I developed, and in terms of 13:37:58

the technical understanding and so on, allowed me to 13:38:02

impart my opinion and also my expertise into the 13:38:09

matter. 13:38:13

Q But the actual language in the report was 13:38:14

written by the lawyers? 13:38:23

A No, the language was written by me where I 13:38:25

have technical opinion. It corresponds to the things 13:38:29

of -- that are important with respect to what I 13:38:36

thought would be a important description of a 13:38:38

particular piece of technology or issue that's 13:38:44

relevant to the matter at hand. 13:38:48

Q You said the language was written by you 13:38:52

where you have technical opinions. Does that mean -- 13:38:54

again, I'm just trying to understand -- 13:38:56

A Yeah, sure. 13:38:58

Q I'm trying to understand, did you write this entire thing or was it written by you in conjunction with the lawyers together? 13:38:59 13:39:01 13:39:04

MR. LENNIE: Objection. Form. 13:39:05

A Well, again, the document has structure which, you know, I received technical assistance -- or legal assistance on. 13:39:12 13:39:14 13:39:17

From the technical aspects of the document, I provided input as to those particular issues and addressed concerns with respect to the -- you know, the concerns raised by the other expect. 13:39:19 13:39:24 13:39:29 13:39:34

Q You -- when you say you provided input, you were providing input to the lawyers? 13:39:40 13:39:42

A No. I'm actually providing content that goes into the document. 13:39:44 13:39:46

Q Okay. So you provided some of the content that went into the document. Or did you provide all of the content? 13:39:48 13:39:50 13:39:54

A I -- well, it's -- this was done in conjunction with -- with legal assistance. I provided 13:39:55 13:40:01

most of the content, but I -- but the issue is, these represent my opinions. So I reviewed everything that's, you know, here in terms of the content and they represent what is my opinion on -- on the matters at hand. 13:40:07 13:40:11 13:40:14 13:40:19 13:40:22

Q Yeah. Okay. I'm just trying to understand, again, kind of -- 13:40:23 13:40:26

A Yeah, I understand. 13:40:27

Q -- who reduced it to writing, and it sounds like you reduced parts of it to writing and the lawyers reduced parts of it to writing. 13:40:27 13:40:30 13:40:32

A Well, again, reduced parts of it to writing. I -- you know, I didn't type it all by hand -- 13:40:35 13:40:39

Q Uh-huh. 13:40:40

A -- but I typed the portions associated with aspects related to technology and also had the opportunity to review those portions in conjunction with other portions. 13:40:40 13:40:44 13:40:48 13:40:52

Again, I'm not a lawyer, so I'm looking for legal assistance in forming my opinions with respect to the report. 13:40:54 13:40:56 13:41:00

Q Okay. So the lawyers wrote parts of the 13:41:03

report? 13:41:05

A The report is mine. 13:41:08

Q Right. 13:41:09

A It represents my opinions. I mean, I received assistance with -- from lawyers, too. 13:41:10 13:41:13

Q Okay. Some of the drafting was done by the lawyers? 13:41:15 13:41:18

A There's some aspects -- certainly legal language and so on are things that they're best to provide. 13:41:19 13:41:21 13:41:25

Q Okay. Let's turn to Paragraph 129. 13:41:25

A Okay. 13:42:05

Q And in Paragraph 129 you say that, "Martin (1993) does not anticipate claim 25 because Martin (1993) fails to disclose an adaptive array." 13:42:06 13:42:10 13:42:15

Do you see that? 13:42:19

A Yes. 13:42:20

Q Why does Martin 1993 fail to disclose an adaptive array? 13:42:20 13:42:24

A (Reviewing.) 13:42:25

Martin 1993 describes applications of his signal-to-noise-ratio estimation algorithm. When he 13:42:34 13:42:39

is describing that, he is looking to apply his SNR estimation technique on systems, and he mentions two such systems, one of them being time delay estimation. 13:42:46 13:42:51 13:42:55

Time delay estimation is an aspect of microphone processing when you have more than one microphone, but it doesn't describe an adaptive array. 13:43:00 13:43:05 13:43:07

Q Why not? 13:43:12

A Because it doesn't describe how contents of the microphone signals would be combined to be able to produce a resulting signal that -- that achieves some useful end. 13:43:13 13:43:18 13:43:23 13:43:27

Q Do you agree that Martin 1993 does talk about using an adaptive array? 13:43:28 13:43:31

A (Reviewing.) 13:43:38

(Exhibit 7 was marked for identification and is attached to the transcript.) 13:43:47 13:43:47

Q Why don't -- 13:43:52

A Yeah, he's -- 13:43:52

Q Oh, sorry. 13:43:52

A Oh, go ahead. 13:43:52

Q I was going to hand you a -- 13:43:52

A Oh. 13:43:54

Q -- marked copy of Martin 1993. 13:43:55
A Thank you. 13:43:57
In the Application section for time delay 13:43:59
estimation he does talk about in-phase summation or 13:44:02
adaptive processing of these microphone signals 13:44:07
usually requires a time delay compensation. 13:44:10
Q And in the previous sentence he refers to 13:44:16
the array. Do you see that? 13:44:20
A I do. He says, "For microphone arrays where 13:44:22
the speaker is in a nonsymmetric position." 13:44:26
Q Okay. So you agree that Martin is -- Martin 13:44:29
refers to a microphone array? 13:44:31
A He doesn't describe the structure -- 13:44:34
Q Uh-huh. 13:44:35
A -- of the adaptive array or the processing. 13:44:37
Q Uh-huh. But he does disclose a microphone 13:44:41
array; is that right? 13:44:49
A Yeah, he -- he mentions a microphone array. 13:44:51
He doesn't describe how the microphone array works 13:44:53
or -- he actually is talking about time delay 13:44:57
estimation, which can be one component of an array, 13:44:59
but doesn't complete the array nor provide all of the 13:45:03

details that allows such an array to be realized. 13:45:07

Q So what are the details about the array that you think Martin had to provide in order for you to say that Martin discloses an adaptive array? 13:45:10 13:45:13 13:45:16

A I -- well -- 13:45:19

MR. LENNIE: Objection. Form. 13:45:20

A Yeah, to -- to have Martin describe an adaptive array, he would have to provide additional information about how the signals are processed. For example, how the signals might be combined, what's the method of combination, what is the procedure by which one is using to -- to compute coefficients, for example. 13:45:21 13:45:24 13:45:27 13:45:31 13:45:34 13:45:38 13:45:42

Q Is all of that required by claim 25? 13:45:43

MR. LENNIE: Objection. Form. 13:45:46

A (Reviewing.) 13:45:47

The understanding of what an adaptive array is requires some description in order to provide, you know, a statement that yes, the information is there and there actually is an adaptive array. And there's no signal computed off of this to determine that actually, you know, a system has actually been 13:46:02 13:46:05 13:46:09 13:46:12 13:46:17 13:46:20

realized from it. 13:46:21

Q Where is that description provided in the '345 patent? 13:46:24 13:46:27

A I'm sorry, I need to look at my report just to be sure that I'm precise. 13:46:43 13:47:32

Q Sure. 13:47:35

A I hope it's okay that I take the time. 13:47:36

Q No, absolutely. 13:47:38

A Thank you. Yeah. 13:47:40

(Reviewing.) 13:47:42

With regard to the '345 patent there are, at the very front, related applications incorporated by reference. 13:51:00 13:51:04 13:51:07

Q Uh-huh. 13:51:08

A One of those applications is U.S. Patent No. '898 issued October 20th, 1998. 13:51:08 13:51:14

The written description that supports and provides structure for the adaptive array can be found in the '898 patent which is incorporated by reference. 13:51:23 13:51:25 13:51:27

Q But it's not in the specification of the '345 itself? 13:51:32 13:51:35

MR. LENNIE: Objection to form. 13:51:37

A It's incorporated by reference within the patent. 13:51:38 13:51:40

Q Right, but what's written in the '345 patent doesn't describe the adaptive processes that you're talking about? 13:51:41 13:51:45 13:51:49

MR. LENNIE: Objection. Form. 13:51:50

A This patent incorporates this other patent by reference, so the description for providing structure is incorporated within the '898 patent. 13:51:53 13:51:55 13:51:58

Q Does claim 25 require any particular type of adaptive processing for a microphone array? 13:52:05 13:52:08

MR. LENNIE: Objection. Form. 13:52:13

A It claims an adaptive array comprising a plurality of microphones for receiving an audio signal. 13:52:24 13:52:26 13:52:30

Q Does that require a specific algorithm or technique for adaptive array processing? 13:52:30 13:52:34

A A particular adaptive array processing algorithm is not required and a particular example or embodiment of that is described in the '898 patent. 13:52:49 13:52:52 13:52:55

Q Okay. Were adaptive microphone arrays known prior to the '345 patent? 13:52:58 13:53:03

A Methods for performing adaptive processing of microphone arrays were available and were -- were or could be used. 13:53:07 13:53:10 13:53:17

Q Okay. Is your report a complete statement of your opinions in this case? 13:53:20 13:53:34

A The report represents my response to the report by Dr. Kyriakakis. It's a rebuttal report. At points within the report I indicate that Dr. Kyriakakis has provided limited and, in some cases, conclusory statements regarding the '345 patent as well as the various references with respect to it, and I found it challenging to respond to those situations, so rather than try to construct a response on something that wasn't there, I put in statements that allowed me to reserve me right to rebut to such arguments should some -- should such an argument come in the future. 13:53:38 13:53:43 13:53:49 13:54:17 13:54:24 13:54:31 13:54:34 13:54:41 13:54:46 13:54:52 13:54:56 13:55:00

Q All right. But it's your complete response to what is in Dr. Kyriakakis's report? 13:55:00 13:55:02

A It is a response to -- to the report that he has provided and the arguments that he's provided at this time. 13:55:07 13:55:10 13:55:13

Q And is it complete or do you have anything to add to the report at this time? 13:55:13 13:55:15

A I don't have anything to add at this particular time. 13:55:20 13:55:22

Q Okay. Is it a complete statement of your reasons for your opinions? 13:55:23 13:55:26

A My reasons? I'm sure -- what do you mean? 13:55:28

Q Does the report contain all of the reasons and bases for your opinions? 13:55:32 13:55:35

A I mean, it contains my opinions. Where situations dictate that I'm required to elaborate -- I think that's why I'm here, so I can elaborate on aspects of it -- but it represents a response that -- to Dr. Kyriakakis's report that I offer at this time. 13:55:49 13:55:53 13:55:56 13:56:00 13:56:04

Q Do you have any additional reasons, sitting here today, that support your opinions, beyond what's said in your report? 13:56:11 13:56:14 13:56:17

A I do not. 13:56:19

Q Are you aware of any mistakes in your report? 13:56:24 13:56:26

A I tried to catch as many typographical errors as possible. There may be some typographical 13:56:27 13:56:31

errors that I missed, but I believe my -- my report to be accurate in that regard. 13:56:34 13:56:37

Q Sitting here today there's nothing you want to correct in your report? 13:56:40 13:56:42

A There's no corrections that I wish to make with the report at this time. 13:56:46 13:56:48

Q Okay. 13:56:50

MR. SWANSON: Let me mark Exhibit 8. 13:56:51

(Exhibit 8 was marked for identification and is attached to the transcript.) 13:56:55 13:57:11

Q Okay. I'm showing you what's been marked as Exhibit 8, beginning with the Bates number Andrea_ITC_1026_00215947, with the ending Bates number of 216215. 13:57:12 13:57:14 13:57:20 13:57:36

Is this a copy of your expert report in the '949 investigation? 13:57:42 13:57:45

A It appears to be. It has certain information, though, that's been redacted due to confidentiality. 13:57:53 13:57:56 13:57:59

Q Okay. And the '949 investigation also involved the '345 patent? 13:58:00 13:58:04

A It did. 13:58:06

Q Okay. One of the prior art references the Respondents in that case were relying on was the Martin 1993 paper; is that right? 13:58:07 13:58:12 13:58:15

A Yes. 13:58:17

Q That's the same paper we were just talking about a moment ago, Exhibit 7? 13:58:18 13:58:20

A Yes. 13:58:22

Q Is that right? 13:58:23

Can you turn to Paragraph 245. 13:58:24

A (Complying.) 13:58:32

Q And the heading right before Paragraph 245 reads, "Alleged Combination of Hirsch with Martin '93" -- 13:58:46 13:58:52 13:58:54

A Uh-huh. 13:58:55

Q -- (Claim 25)," and then the following two paragraphs, 245 and 246, are discussing claim 25 of the '345 patent; is that right? 13:58:56 13:59:01 13:59:06

A It does. 13:59:11

Q Okay. And in this report in the '949 case, you didn't argue that Martin '93 fails to disclose an adaptive array, right? 13:59:12 13:59:18 13:59:26

A (Reviewing.) 13:59:35

MR. LENNIE: Objection. Form. 13:59:38

A No, I didn't. What I argued was that one of ordinary skill would not have been motivated to combine these references to obtain the apparatus. 13:59:45 13:59:49 13:59:52

Q Okay. You can put that to the side. 13:59:57

(Exhibit 9 was marked for identification and is attached to the transcript.) 14:00:22 14:00:22

Q Exhibit 9 is U.S. Patent No. 6,035,048. This is the Diethorn patent; is that right? 14:01:02 14:01:10

A Yes, it is. 14:01:16

Q This is the same patent we were talking about this morning, Diethorn? 14:01:17 14:01:19

A It is. 14:01:21

Q All right. You -- you familiar with this patent? 14:01:22 14:01:26

A I am. 14:01:27

Q You provided opinions on this patent in your report? 14:01:28 14:01:31

A I have. 14:01:32

Q Can you turn to Paragraph 741 of your report? 14:01:57 14:02:03

A Okay. 14:02:17

Q And in Paragraph 741 you say Diethorn does not anticipate claim 13 of the patent? 14:02:18 14:02:21

A Yes. 14:02:24

Q And then in Paragraph 742 you say, "The system of Diethorn does not guarantee that the gain value is less than 1 when noise values are detected, and therefore Diethorn does not teach a system that includes a subtractor that subtracts said noise elements." 14:02:25 14:02:29 14:02:32 14:02:36 14:02:40 14:02:43

Do you see that? 14:02:44

A Yes, I do. 14:02:45

Q What do you mean by "Diethorn does not guarantee that the gain value is less than 1 when noise values are detected"? 14:02:46 14:02:50 14:02:54

A In Diethorn, column 8, he describes the operation of his system in Figure 9 -- this is at line 24 -- and he states, "... the signal gain function g(k,m) is determined by PHI(k,m), but has an upper bound of unity." That is, g(k,m) is equal to the minimum of 1.0 and PHI(k,m). 14:03:06 14:03:11 14:03:16 14:03:22 14:03:27 14:03:30

Q Uh-huh. 14:03:35

A And so he is describing a system which 14:03:38

processes the signal using PHI(k,m)). PHI(k,m) are -- is computed from the normalized deflection coefficients, and these deflection coefficients depend upon other processes, including a noise estimate value n(k,m). 14:03:41 14:03:47 14:03:50 14:03:56 14:04:00

The system, when it processes signals, its PHI(k,m) value determines the processing, and it's not clear how -- or I should say, a system which performs noise -- detection of noise values would produce noise -- sorry, would estimate noise and would produce an output signal that would generally reduce it when there's noise that's present. 14:04:09 14:04:14 14:04:23 14:04:33 14:04:36 14:04:43 14:04:48

Here is a system that's producing an output which is not changing the gain when -- you know, for some aspects of the system, and it's not clear that this system when it's connected to the noise estimate that it's actually being used to -- to do that processing when detection of noise is -- is made. 14:04:51 14:04:54 14:04:58 14:05:02 14:05:05 14:05:08

Q Are you saying that Diethorn would never set the gain function less than one when noise is detected? 14:05:12 14:05:17 14:05:23

A No, I'm saying that the system, when it 14:05:37

detects noise, does not ensure that the gain is less than one. 14:05:40 14:05:42

Q Why does it not ensure the gain is less than one? 14:05:44 14:05:47

A Because through the processing there's no direct connection between this and -- sorry. When computing the g(k,m), if a system is detecting noise, then the gain of the system should then try to reduce the resulting output. 14:05:49 14:05:52 14:05:56 14:06:03 14:06:06

Q So it may set the gain value less than one when there's noise, but you're saying it also may not? 14:06:10 14:06:13

A That's correct. 14:06:17

Q Why -- why would you want to have a system that -- where the gain value is one when you've detected noise? 14:06:20 14:06:24 14:06:27

MR. LENNIE: Objection. Form. 14:06:29

Q What would -- 14:06:30

A I mean -- I'm -- 14:06:31

Q You know what, strike that question. Yeah. 14:06:40

A You would want a system to detect noise to be less than one when noise is detected. I think you said the opposite. 14:06:42 14:06:46 14:06:49

Q Well, you're saying -- never mind. 14:06:51

Okay. So you mention -- so the gain 14:06:57

function is set based on the value of Phi? That's 14:07:04

what you said? 14:07:09

A Correct. 14:07:10

Q And Phi is set or is determined based on the 14:07:12

two deflection coefficients? 14:07:18

A Yes, the broadband and the narrowband 14:07:21

deflection coefficients. 14:07:24

Q Okay. And those are represented by 14:07:25

lowercase D and uppercase D -- 14:07:27

A Yes. 14:07:29

Q -- in Diethorn? 14:07:29

And in column 8, line -- I guess it's line 14:07:31

16, the formula for Phi, that's taking the maximum of 14:07:37

the narrowband deflection coefficient divided by 14:07:42

GAMMA_NB? 14:07:48

A Uh-huh. 14:07:50

Q And the broadband deflection coefficient 14:07:50

divided by GAMMA_BB? 14:07:53

A Uh-huh. 14:07:57

Q Is that right? 14:07:57

A Yes. 14:07:59

Q Okay. And if you go further up in column 8, 14:08:00

column 8 -- I guess the very top of column 8, line 1. 14:08:10

A Uh-huh. 14:08:14

Q According to the first of these formulas, 14:08:15

the narrowband and broadband deflection coefficients 14:08:16

are each normalized to a respective GAMMA_NB or 14:08:21

GAMMA_BB. 14:08:27

A Uh-huh. 14:08:29

Q Do you see that? 14:08:29

A Yes. 14:08:30

Q Okay. And then the next sentence says, 14:08:30

"These thresholds represent the respective levels at 14:08:30

which the deflection ratios are declared to indicate a 14:08:34

certainty of speech energy." 14:08:38

Do you see that? 14:08:41

A Yes. 14:08:42

Q That sentence in Diethorn is saying that 14:08:42

GAMMA NB and GAMMA BB would be set such that where, 14:08:45

unless you're certain that there is speech, the gain 14:08:51

value will be less than one so you can reduce noise? 14:08:56

MR. LENNIE: Objection. Form. 14:09:17

A These quantities, GAMMA NB and GAMMA BB, are referred to by Diethorn as respective thresholds, but there is no decision being made here with respect to these quantities in regards to whether the signal contains speech energy. 14:10:25 14:10:28 14:10:34 14:10:37 14:10:43

Q But isn't Diethorn saying that you should set those two thresholds at a value where you're certain that the signal is speech? 14:10:47 14:10:50 14:10:55

A It's not stating that one should set those thresholds, it's saying that there's a value that he's chosen for those parameters and there's no decision being made here. 14:11:10 14:11:13 14:11:16 14:11:19

Q But the value he's chosen for those parameters is the value where there's a certainty of speech, right? 14:11:22 14:11:24 14:11:28

A Again, this description doesn't involve making a decision on, you know, these deflection coefficients as to whether they're speech or not. 14:11:33 14:11:40 14:11:45

Q What do you think that second sentence means? 14:11:54 14:11:57

A Well, they represent the levels at which the deflection ratios are declared to indicate a certainty 14:12:01 14:12:04

of speech. So they're set according to a concept of, well, what is in these particular values in terms of what is it that they represent, but there is no decision being made here in the system. There's no calculation that's being done at this point. 14:12:09 14:12:13 14:12:19 14:12:23 14:12:26

Q Right. The actual calculation is the calculation of Phi below, right? 14:12:31 14:12:34

A There is a calculation of Phi which is then using those gamma values, yes. 14:12:38 14:12:40

Q Right. So in his system he sets the gamma values to 30, right? 14:12:43 14:12:47

A Well, he is choosing the value 30 for both GAMMA NB and GAMMA BB. 14:12:48 14:12:51

Q Right. And he says 30 is the level at which you're certain that there is speech, right? 14:12:54 14:12:56

A Yeah. Again, he's not making a decision, though, on those particular values. He's not looking at particular values of deflection ratios to decide whether they -- they contain speech or not. 14:13:13 14:13:15 14:13:18 14:13:22

Q But he is saying that the values that he's chosen and that should be chosen for gamma are the values at which speech is certain, right? 14:13:28 14:13:32 14:13:36

A Well, they're chosen to allow PHI(k,m) to -- to be run or calculated. And PHI(k,m) then combines deflection ratios in a way to -- to produce a value for PHI(k,m) which chooses one or the other. 14:13:47 14:13:49 14:13:56 14:14:00

Q So in Diethorn's system if the deflection coefficients are less than 30, then the gain function -- the gain value will be less than one, right? 14:14:03 14:14:06 14:14:10 14:14:13

A I'm sorry, could you repeat your statement? 14:14:16

Q In Diethorn, if the deflection coefficients, lowercase D and uppercase D, are less than 30, then the value of the gain will be less than one? 14:14:19 14:14:23 14:14:30

A The value of the gain depends upon PHI(k,m), which depends upon both small d(k,m) and large D(k,m), which are these narrowband and broadband deflection coefficients. There's not a decision being made that says one or the other contains speech in this equation. 14:14:46 14:14:50 14:14:54 14:15:00 14:15:04 14:15:07

Q That's not my question. 14:15:08

A Okay. 14:15:09

Q If the value of the narrowband deflection is less than 30, and if the value of the broadband 14:15:10 14:15:15

deflection is less than 30, then the gain value will be less than one, correct? 14:15:18 14:15:21

A For his chosen value, then both the small d(k,m) divided by its gamma and the large D(k,m) divided by its gamma will be less than one, and so the maximum of those two will be less than one. 14:15:27 14:15:31 14:15:34 14:15:40

But that's for the first formula. There's also the second formula, and that requires another parameter P that needs to be chosen, but both of -- sorry. 14:15:42 14:15:50 14:15:54 14:15:57

Q And would that -- would that affect the gain value? 14:15:58 14:16:02

A Well, the value of P does. 14:16:03

Q Right, but P is an ex- -- is an exponent, right? Just being raised to a power? 14:16:08 14:16:11

A Yes, P is an exponent -- 14:16:18

Q Right. 14:16:19

A -- yes. 14:16:20

Q So if the deflection coefficient -- 14:16:21

A Yes. 14:16:23

Q -- divided by GAMMA NB is less than one -- 14:16:23

A Then it's -- it's the same situation. 14:16:26

Q Okay. 14:16:28
A From that regard. 14:16:28
Q And Diethorn in column 8, line 12, says P is equal to unity, right? 14:16:29 14:16:34
A Right. So it's a linear function. 14:16:36
Q Right. Unity is one, right? 14:16:37
A Yes. 14:16:40
Q Okay. So it -- in this system, it wouldn't actually affect the -- 14:16:40 14:16:42
A Right. 14:16:43
Q -- gain value? 14:16:43
A That is correct. 14:16:44
Q Okay. So in your opinion, claim 13 requires a system in which the gain values always have to be less than one when noise is detected? 14:16:45 14:16:57 14:17:01
A A system that's performing spectral subtraction and performing noise reduction would generally need to perform some amount of reduction of that noise, and so if the noise is not zero, then there will be some reduction in the overall gain of the system. 14:17:28 14:17:30 14:17:34 14:17:38 14:17:45 14:17:47
Q Okay. I'm asking about your understanding 14:17:57

of claim 13. 14:18:00

A Uh-huh. 14:18:02

Q You said Diethorn does not anticipate claim 13 because it does not guarantee that the gain value is less than one. 14:18:03 14:18:07 14:18:09

A Right. 14:18:11

Q So is it your opinion that claim 13 requires a system in which the gain values are always less than one when noise is detected? 14:18:11 14:18:14 14:18:17

A My analysis of Diethorn with respect to claim 13 applies to Diethorn. In other words, I am -- I am -- and my analysis is appropriate with respect to Diethorn's functioning of the system. I'd have to look at the nature of the system to decide this resulting issue. 14:18:23 14:18:26 14:18:31 14:18:34 14:18:38 14:18:41

Q But you're offering an opinion as to whether Diethorn meets the requirements of the claim, right? 14:18:42 14:18:45

A Right. 14:18:47

Q So you must have an understanding of what the claim requires. 14:18:48 14:18:50

A Yes. 14:18:51

Q Does the claim require a system in which the 14:18:52

gain value is always less than one when noise is detected? 14:18:54 14:18:57

MR. LENNIE: Objection. Form. 14:18:58

A No, it does not, it depends upon the operation of the overall system. It depends on the nature of the resulting processing. 14:19:02 14:19:04 14:19:09

Q Okay. Let's turn to Paragraph 93 of your report. 14:19:13 14:19:24

A Uh-huh. 14:19:39

Q And in Paragraph 93 you are discussing the Martin 1993 reference; is that right? 14:19:47 14:19:52

A Yes. 14:19:55

Q Okay. And in the second sentence in Paragraph 93 you say, "In my opinion, the value of PMmin" -- 14:19:56 14:20:08 14:20:14

A Uh-huh. 14:20:18

Q -- "is not a threshold for a given frequency bin ..." 14:20:20 14:20:25

What's your basis for that? 14:20:28

Let me ask a clearer question, actually. 14:20:31

A Uh-huh. 14:20:43

Q Why is PMmin not a threshold for a frequency 14:20:43

bin within the meaning of claim 1? 14:20:50

A Martin 1993 describes a system for 14:21:15

estimating the instantaneous signal-to-noise-ratio. 14:21:19

It applies to a full band signal. It's oriented 14:21:23

towards performing this signal-to-noise-ratio 14:21:33

estimation. 14:21:38

The value of PMmin is not being used within 14:21:55

the threshold detector for setting a threshold for 14:22:00

each frequency bin, and there are no frequency bins 14:22:05

associated with the system in Martin 1993. 14:22:09

Q So is your opinion that PMmin -- let me 14:22:15

start over. 14:22:20

So your opinion is that Martin '93 does not 14:22:27

have frequency bins and, therefore, PMmin is not a 14:22:33

threshold for a frequency bin? 14:22:39

A That's one of the reasons. 14:22:40

Q Okay. Do you have an additional reason? 14:22:42

A (Reviewing.) 14:22:56

The value PMmin is not a threshold for a 14:23:17

given frequency bin. It represents the value of 14:23:21

either P max or the smallest input sample within a 14:23:27

given subwindow. And there are multiple subwindows in 14:23:31

a given data window. And only one of these subwindows is used to update the value of PMmin. 14:23:36 14:23:39

Q So why does that mean that PMmin is not a threshold? 14:23:45 14:23:49

A It's not being used for setting a threshold for -- it's not being used to set a threshold. 14:24:00 14:24:03

Q Why is that? 14:24:07

A It doesn't use it. It doesn't use it in a threshold calculation from the standpoint of setting a threshold. 14:24:10 14:24:13 14:24:15

Q Is it used to detect the position of noise elements? 14:24:17 14:24:19

A It's not used to detect the position of noise elements. 14:24:28 14:24:30

Q Why not? 14:24:34

A Because it's not a threshold for -- well, it's not a threshold, and it's not a threshold for a frequency bin. 14:24:37 14:24:39 14:24:42

Q Do you have Martin '93 in front of you? 14:25:06

A I do. 14:25:08

Q Okay. The variable Pn in Martin '99 -- Martin 1993 -- that's the noise power estimate? Is 14:25:09 14:25:17

that right? 14:25:28

A It's the estimated noise power, yes. 14:25:31

Q Is that a threshold within the meaning of the claims? 14:25:36 14:25:38

A This system performs signal-to-noise-ratio estimation. It is not used as a threshold within the system. Within the meaning of the claims. 14:25:50 14:25:54 14:25:58

Q Is Pn used to detect noise elements within the meaning of the claims? 14:26:12 14:26:16

A The value Pn(i) is not used as a role of a threshold in making a decision within this algorithm. 14:26:34 14:26:39

Q Okay. Can I point you to Figure 2 of Martin '93? 14:26:42 14:26:46

A Yes. 14:26:48

Q Do you have that? Okay. 14:26:48

And do you see on the left-hand side of the figure -- the text is small, but the second block down on the left, there's a formula, Pn(i) equals min of Px(i), Pn(i)? 14:26:50 14:26:53 14:27:00 14:27:11

A Yes. 14:27:16

Q Do you see that? 14:27:17

Is that formula segment, Pn, the noise power 14:27:19

estimate, equal to the minimum of the current signal power and the current noise power estimate? 14:27:24 14:27:30

A This block is taking -- there is a value in Pn(i), and that value is either staying the same or changing depending upon the value of Px bar (i). 14:27:37 14:27:42 14:27:48

Q Right. So if P -- Px(i) is less than Pn, then Pn becomes Px. 14:27:53 14:28:02

Let me try that again. 14:28:09

If I -- what this formula is doing is if the current signal power is less than the current noise power estimate, then you set the noise power estimate equal to the current signal power? 14:28:11 14:28:16 14:28:19 14:28:23

A Pn(i) stays the same unless Px bar (i) is less than Pn (i), at which point it changes to Px bar (i). 14:28:28 14:28:35 14:28:40

Q Right. And P -- Px (i), that's the signal power? 14:28:41 14:28:45

A That is the signal power, yes. 14:28:47

Q Okay. And so when that's below the noise power estimate, then Martin sets the noise power estimate equal to the signal power? 14:28:49 14:28:52 14:28:56

A The value of PN (i) stays the same or it 14:29:03

changes. If it changes, it would happen because Px bar is less than Pn. 14:29:07 14:29:11

Q Right. Is that a detection of noise element within the meaning of the claims? 14:29:13 14:29:21

MR. LENNIE: Objection. Form. 14:29:23

A It's not a detection of noise elements within the meaning of the claims. This is part of some method for calculating Pn(i). 14:29:32 14:29:35 14:29:40

Q Can you turn to Paragraph 926. 14:30:01

A (Complying.) 14:30:14

MR. SWANSON: Actually, let me go ahead and mark this as well. 14:30:15 14:30:25

(Exhibit 10 was marked for identification and is attached to the transcript.) 14:30:26 14:30:38

Q I just handed you Exhibit 10. Is this the Martin 1994 paper that's discussed in your report? 14:30:49 14:30:52

A It is. 14:30:56

Q Okay. And you're familiar with this paper? 14:30:57

A I am. 14:31:00

Q Okay. And in Paragraph 926 of your report you say that neither PMact nor Pmin constitutes a threshold for a frequency bin. 14:31:01 14:31:18 14:31:31

A That's correct. 14:31:34

Q Why do those values not constitute thresholds for a frequency bin? 14:31:37 14:31:39

A There's no test with respect to those values where you're using -- you are setting a threshold with those values to make some decision with respect to the overall process. 14:32:27 14:32:31 14:32:36 14:32:41

Q Can you explain what you mean by that? I'm not sure I followed that answer. 14:33:03 14:33:05

A PMact -- neither PMact nor Pmin are a threshold for a frequency bin. They are simply values that are used to track the minimum of the M samples across a window of M samples, which is a portion of a window of length D, considering the entire set of samples of a frequency bin. 14:33:18 14:33:26 14:33:34 14:33:40 14:33:48 14:33:54

Q Okay. Can you turn back to your '949 report? 14:33:59 14:34:04

MR. LENNIE: Exhibit 8. 14:34:12

Q And specifically Paragraph 566. 14:34:16

A (Complying.) 14:34:34

Q In Paragraph -- are you there? 14:34:35

A Uh-huh, I am. 14:34:38

Q Paragraph 566 is discussing the same Martin 1994 paper we were just looking at? 14:34:39 14:34:43

A Uh-huh. Yes. 14:34:46

Q Do you agree with what you said in Paragraph 566? 14:34:49 14:34:51

A (Reviewing.) 14:34:57

Sorry, I'm reading it, because I'm recalling the argument. If you recall, this matter was some time ago. I want to make sure I have the technical ideas. 14:35:52 14:35:55 14:35:58 14:36:01

Q Absolutely, yeah. 14:36:02

A (Reviewing.) 14:36:04

Yes, I agree with this, and that enabled me to orient myself on the arguments that are presented here. 14:37:06 14:37:11 14:37:14

Q Okay. Is this saying the same thing as what you're saying in your report in this case about Martin 1994? 14:37:14 14:37:18 14:37:21

A It's not saying the same thing, no. I don't mean to have this in place of that. If I wanted this in place of that, I would have put it there. 14:37:26 14:37:31 14:37:34

Q Okay. Why did you change what you said 14:37:36

about Martin 1994? 14:37:39

A My current report is a rebuttal report in 14:38:12

response to Dr. Kyriakakis's assertions. 14:38:15

Q Uh-huh. 14:38:21

A So this is a response to his. 14:38:21

Q Uh-huh. 14:38:24

A It doesn't contain everything that I've 14:38:24

written from other reports in every context. 14:38:27

Q Uh-huh. 14:38:29

A It is -- I've written it with the 14:38:30

understanding and -- and concept that I am responding 14:38:35

to what Dr. Kyriakakis has said in his report. 14:38:39

He makes the conclusory assertion that PMact 14:38:45

and PM teach the threshold detector limitation, and I 14:38:49

provided what I thought was sufficient detail to 14:38:57

address his assertion. 14:39:00

Q Okay. 14:39:03

MR. SWANSON: Go off the record. 14:39:07

THE VIDEOGRAPHER: Going off the record. 14:39:09

The time is 2:39. 14:39:09

(A recess was taken.) 14:39:11

(Back on the record at 2:50 p.m.) 14:39:11

THE VIDEOGRAPHER: We're back on the record. 14:50:15

EXAMINATION BY COUNSEL FOR RESPONDENT APPLE, INC. 14:50:20

BY MR. BROUGHAN: 14:50:20

Q Good afternoon, Professor Douglas. 14:50:21

A Good afternoon. 14:50:22

Q Tom Broughan. I'm going to ask you a few questions on behalf of Apple and Respondents. 14:50:23 14:50:25

I want to continue with the Martin reference that we were just discussing, but if you could open your report, please -- 14:50:28 14:50:30 14:50:33

A Uh-huh. 14:50:34

Q -- to Paragraph 183. 14:50:34

A Uh-huh. 14:50:49

Q In the second or third sentence you state, "Martin (1993) operates on a broadband, time domain signal." 14:50:52 14:50:55 14:51:01

Do you see that? 14:51:02

A I do. 14:51:03

Q And then two sentences later you state, "In my opinion, the Martin (1993) algorithm would require non-trivial modifications in order to operate in the frequency domain in the manner claimed by the '345 14:51:05 14:51:07 14:51:13 14:51:17

patent." 14:51:20

Do you see that? 14:51:20

A I do. 14:51:22

Q You agree that the '345 patent requires performing operations in the frequency domain? 14:51:32 14:51:35

A This '345 patent employs FFT processing which generates frequency domain components from a time domain signal, and those frequency domain components are operated upon in a frame-by-frame basis, thereby allowing them to have indexes in time. 14:51:43 14:51:45 14:51:51 14:51:54 14:51:57

Q Uh-huh. So you state that, Martin would require nontrivial modifications to operate in the frequency domain. 14:52:03 14:52:07 14:52:10

What sorts of modifications would be required? 14:52:12 14:52:14

A Well, in order to operate in the frequency domain in the matter claimed by the '345 patent. So at a minimum -- at a minimum it would require employing a device that would be computing frequency bins because the system in '345 employs frequency bins as a result of its processing. 14:52:19 14:52:21 14:52:26 14:52:30 14:52:34 14:52:41

And it would also require additional 14:52:44

modifications with regard to threshold detection and also setting a threshold using a noise estimation process. Those are some examples. 14:52:48 14:52:54 14:52:58

Q You agree that the '345 patent requires generation of frequency bins? 14:53:01 14:53:05

A The '345 patent generates frequency domain components in order to be essentially implemented to allow the system to then do its processing on its signals in time. 14:53:12 14:53:17 14:53:24 14:53:27

Q Earlier you stated that the system in the '345 employs frequency bins as a result of its processing. Is that correct? 14:53:30 14:53:33 14:53:36

A That's correct. 14:53:39

Q So you agree that the '345 patent requires frequency bins as a result of its processing? 14:53:40 14:53:43

MR. LENNIE: Objection. Form. 14:53:47

A The '345 patent describes a system which uses processing to generate frequency domain components. There are many ways to perform that frequency domain calculation. And '345 allows for different methods to perform that calculation. 14:53:54 14:53:59 14:54:04 14:54:07 14:54:12

Q Uh-huh. Okay. Would you pick up the Martin 14:54:15

'93 article, please, and turn to Page 1096. Or the back. On the right-hand side there's a heading called "Spectral Subtraction." 14:54:19 14:54:29 14:54:33

Do you see that? 14:54:35

A I do. 14:54:37

Q And in this section Martin describes experiments using a filter bank with 256 channels, correct? 14:54:37 14:54:41 14:54:45

A He says, "In our experiments we used a filter bank with 256 channels ..." 14:54:48 14:54:50

Q And he goes on to say that in his experiments he estimated the minimum power of the signal in each of those 256 channels, correct? 14:54:55 14:54:59 14:55:02

A He says he estimated the minimum power in each of these channels. 14:55:06 14:55:09

Q There are 256 channels, correct? 14:55:24

A He says, we used a filter bank with 256 channels. 14:55:29 14:55:33

Q In this passage of Martin '93, is he discussing operations performed in the frequency domain? 14:55:35 14:55:39 14:55:42

A Martin 1993 is focused on the estimation of 14:55:56

signal-to-noise-ratio, and its primary description and technical discussion is around that -- that problem and approach. 14:56:00 14:56:05 14:56:09

The description that he has here is brief and does not provide very much detail with respect to the overall processing that he does. It's not clear from this what the exact structure is that he is using. 14:56:11 14:56:15 14:56:20 14:56:24 14:56:27

Q So you don't know whether Martin 1993 discloses performing operations in the frequency domain? 14:56:35 14:56:39 14:56:42

MR. LENNIE: Objection. Form. 14:56:43

A From this description it's not obvious what exactly he is doing from the standpoint of his processing. 14:56:46 14:56:48 14:56:51

Q Could he be operating in the time domain? 14:56:55

MR. LENNIE: Objection. Form. 14:57:02

A Again, there's not many -- much detail to be able to determine exactly what the processing is that he's using in this particular brief description of an application. 14:57:08 14:57:11 14:57:13 14:57:17

Q In the Spectral Subtraction section on Page 14:57:19

1096 of Martin 1993 he could be describing performing operations in the time domain or he could be describing operations performed in the frequency domain? Is that your opinion? 14:57:22 14:57:28 14:57:30 14:57:33

A Again, it's not obvious what he is doing. He hasn't provided enough sufficient detail with regard to his processing to determine exactly what's going on. 14:57:35 14:57:37 14:57:40 14:57:42

Q And you've looked at this passage of Martin 1993 and you can't figure it out? 14:57:47 14:57:49

MR. LENNIE: Objection. Form. 14:57:53

A There's not enough detail here to determine exactly what is going on. 14:57:55 14:57:57

Q So you don't know whether each of the 256 channels of the filter bank is a frequency bin? 14:58:06 14:58:09

A Again, he has not provided enough detail to determine exactly what the processing is that he is using. 14:58:14 14:58:17 14:58:20

Q So you can't say for certain whether each of the 256 channels of the filter bank is a frequency bin? 14:58:36 14:58:39 14:58:42

A Whether each of the channels? 14:58:45

Q Yes. 14:58:48

A Again, the system structure is not detailed 14:58:49

enough to be able to determine what that is. He 14:58:52

doesn't aprive -- provide enough structure to really 14:58:57

figure out what's going on there. 14:59:01

Q So you can't say one way or the other 14:59:03

whether it's a frequency bin or not? 14:59:05

A I can't say one way or another with respect 14:59:07

to this description what he is doing. 14:59:08

Q Okay. In your report would you please turn 14:59:12

to Paragraph 97. 14:59:20

A Uh-huh. 14:59:21

Q You considered a figure from 14:59:39

Dr. Kyriakakis's report; is that correct? 14:59:43

A I did. 14:59:46

Q Are you pulling up the figure? 14:59:54

A Yeah, I'm getting to it, because we're 14:59:56

mentioning it. 14:59:58

Q It's Paragraph 402, if that's helpful. 15:00:02

A Uh-huh, yes. 15:00:06

Q In Paragraph 97 of your report you do not 15:00:09

note anything about Dr. Kyriakakis's figure that is 15:00:14

inaccurate, correct? 15:00:17

A Can you be more specific with respect to the inaccuracy that you're referring to? 15:00:48 15:00:49

Q Well, you state, "... this hypothetical system would eliminate a significant and integral portion of the system of Martin (1993)." 15:00:52 15:00:54 15:00:58

Is that correct? 15:01:03

A Yes. 15:01:03

Q But you don't note anything about the figure that is inaccurate or incorrect? 15:01:05 15:01:08

MR. LENNIE: Objection. Form. 15:01:14

A My statement is not being applied to this particular figure; my statement applies to the -- to the system of Martin 1993. 15:01:16 15:01:19 15:01:25

Q Which statement is not being applied to this particular figure? 15:01:35 15:01:37

A "This hypothetical system would eliminate" -- the "significant and integral portion." I'm referring to the significant and integral portion of Martin 1993 that's not represented in this figure. 15:01:38 15:01:40 15:01:45 15:01:49

Q And that significant and integral portion of Martin 1993 are the subwindows? 15:01:58 15:02:00

A One of the aspects of the system is the use of subwindow processing within Martin 1993. 15:02:08 15:02:13

Q Uh-huh. And Dr. Kyriakakis's figure assumes a system where the number of subwindows is one, correct? 15:02:17 15:02:21 15:02:24

A Yes. 15:02:25

Q If the Martin algorithm were to run using one as the number of subwindows, is the figure that Dr. Kyriakakis provided accurate? 15:02:29 15:02:35 15:02:39

A The system is not specified for a value of one subwindow. The system assumes that a data window of length L is decomposed into W windows of length M. 15:02:50 15:02:56 15:03:02

Q Would you be able to configure the Martin 1993 algorithm to use a subwindow -- strike that. 15:03:18 15:03:21

Would you be able to configure the Martin 1993 algorithm to use a single subwindow? 15:03:27 15:03:30

A The Martin 1993 algorithm is created with the specific design choice of W windows and its structure assumes the use of multiple subwindows. 15:03:37 15:03:45 15:03:52

Q Would you be able to configure the Martin 1993 algorithm to use a single subwindow even though the Martin 1993 paper describes using more than one 15:03:59 15:04:00 15:04:05

subwindow? 15:04:10

A Any attempt at some sort of configuration would significantly change the method that's being described in Martin 1993. It would cease to be the algorithm that Martin 1993 is describing. 15:04:13 15:04:16 15:04:18 15:04:23

Q So you would be unable to change the Martin 1993 algorithm to use a single sub- -- strike that. 15:04:29 15:04:33

So you would be unable to change the Martin 1993 algorithm to use a single subwindow; is that correct? 15:04:41 15:04:43 15:04:48

MR. LENNIE: Objection. Form. 15:04:50

A Looking at the Martin 1993 algorithm, it uses multiple subwindows in order for its processing. If you're asking me to change the algorithm in some hypothetical way, it would change it from Martin, it would no longer be the algorithm that Martin 1993 is describing. 15:04:54 15:04:57 15:05:02 15:05:06 15:05:09 15:05:13

Q But would you be able to make that change to the Martin algorithm? 15:05:14 15:05:15

(Mr. Haslam joined the proceedings.) 15:05:17

A Well, the description of the algorithm requires multiple subwindows. I don't see the point 15:05:23 15:05:25

of trying to change it at this point. 15:05:28

Q So you don't know how to do it? 15:05:31

MR. LENNIE: Objection. Form. 15:05:33

A It's not something that's part of the Martin 1993 approach. 15:05:36 15:05:39

MR. BAIK: Can whoever joined go on mute, please? 15:05:44 15:05:47

(Pause in the proceedings.) 15:06:07

Q You are a person of ordinary skill in the art? 15:06:15 15:06:17

A I am. 15:06:17

Q So even though Martin 1993 does not describe using a single subwindow, you would be unable to modify Martin to use a single subwindow? 15:06:20 15:06:23 15:06:29

A Martin 1993 contemplates using a data window of length L that's decomposed into W windows of length M -- 15:06:32 15:06:36 15:06:41

Q Uh-huh. 15:06:41

A -- where W is two or more, because he says W windows. 15:06:42 15:06:45

Q Would a person of ordinary skill in the art lack the technical expertise to modify Martin to use a 15:06:46 15:06:49

single subwindow? 15:06:54

A If one were to try to contemplate the 15:06:58

change, it would change the algorithm away from 15:07:01

Martin, it would no longer be what the description of 15:07:04

Martin is, and it would remove significant portions of 15:07:07

the system to try to do so. 15:07:11

Q But that person would be able to make the 15:07:23

change? 15:07:25

A I don't see why someone would be motivated 15:07:47

to consider such a change. 15:07:50

Q Your opinion is that someone would not be 15:07:52

motivated to consider making that change, not that the 15:07:54

person would be unable to make the change? 15:07:58

A Well -- and to make the change would then 15:08:02

change the algorithm such that it would no longer be 15:08:05

what Martin is describing in his paper. 15:08:08

Q Does the Martin 1993 algorithm contemplate 15:08:18

using two subwindows? 15:08:22

A The algorithm describes typical window 15:08:32

parameters where W is equal to four, which would 15:08:35

correspond to four subwindows. 15:08:39

Q Could you adjust the Martin 1993 algorithm 15:08:41

to use two subwindows? 15:08:45

A Yes, you could. 15:08:47

Q Would a system -- strike that. 15:08:59

With respect to Dr. Kyriakakis's figure, do you dispute the way he depicts the tracking of the minimum values? 15:09:13 15:09:16 15:09:21

MR. LENNIE: Objection. Form. 15:09:22

A The figure describes some method which uses a value of W equal to one, which would be one subwindow, which doesn't make sense with respect to Martin 1993. So I'm not sure how this particular figure relates to Martin 1993. 15:09:34 15:09:39 15:09:43 15:09:46 15:09:50

Q So you are unable to perform the analysis required to determine whether the figure in Dr. Kyriakakis's report is accurate because it assumes that the subwindow size in Martin is one? 15:09:53 15:09:55 15:09:58 15:10:03

A I'm not sure what the term "inaccurate" means when it's describing a system which has the number of subwindows which Martin doesn't consider. 15:10:22 15:10:24 15:10:28

Q Would you go to Paragraph 100, please, of your report? 15:10:43 15:10:46

A (Complying.) 15:10:47

Q Here you are discussing the array of PMmin? PM M-I-N? 15:10:57 15:11:01

A Yes. 15:11:06

Q And you state, "The claim language states that the current minimum is updated in accordance with a single future minimum value of the frequency bin." 15:11:07 15:11:10 15:11:12

Correct? 15:11:16

A Yes. 15:11:17

Q Why do you think that the claim is limited to a single future minimum value? 15:11:22 15:11:24

A Because current minimum value and future minimum value imply that there's some connection between those two. It doesn't make sense to call something a future minimum and something a current minimum and not have them be related to each other in terms of the way they're calculated. 15:11:33 15:11:36 15:11:41 15:11:44 15:11:46 15:11:51

Q In your view, the fact that there is a current minimum and a future minimum means that the claim is limited to a single future minimum value? 15:11:54 15:11:57 15:12:00

MR. LENNIE: Objection. Form. 15:12:07

A The claim language says said current minimum value being derived in accordance with a future 15:12:13 15:12:15

minimum value. A future minimum value would be over an appropriate frequency bin. 15:12:18 15:12:21

Q You agree that claim 4 requires a single future minimum value? 15:12:29 15:12:32

A It requires a future minimum value of the corresponding frequency bin, that frequency bin being a data window of an appropriate number of samples that corresponds to the window associated with the current minimum value. 15:12:37 15:12:41 15:12:45 15:12:51 15:12:53

Q Would a system that used two future minimum values practice claim 4 of the '345 patent? 15:12:56 15:12:59

MR. LENNIE: Objection. Form. 15:13:05

A It's hard to contemplate an answer to that question without looking at a specific structure associated with that. 15:13:31 15:13:33 15:13:36

Q You state that, "The claim language states that the current minimum is updated in accordance with a single future minimum value of the frequency bin." 15:13:39 15:13:41 15:13:44

Correct? 15:13:48

A Correct. The future minimum value of the corresponding frequency bin, that frequency bin being of a size corresponding to that of the current 15:13:49 15:13:54 15:14:00

minimum. 15:14:04

Q "The frequency bin being a size 15:14:05

corresponding to that of the current minimum." 15:14:10

What do you mean? 15:14:13

A A frequency bin contains some number of 15:14:15

samples. We're talking about the minimum over a 15:14:18

frequency bin. We have to take a collection of 15:14:22

samples. We can't talk about a minimum of one value. 15:14:24

Q A frequency bin itself does not contain 15:14:30

multiple frequency bins? 15:14:35

A In the context of the '345 patent, we're 15:14:41

talking about processing of values in a frequency bin. 15:14:47

We have to be talking about the frequency bin values. 15:14:52

In this case, it's a future minimum value of 15:14:56

the corresponding frequency bin. That's referring to 15:14:59

the number of samples that are being computed for the 15:15:02

minimum value. 15:15:06

Q In Paragraph 100 of your report why do you 15:15:18

state that the claim language requires a single future 15:15:21

minimum value? 15:15:25

A I say, "The claim language states that the 15:15:37

current minimum is updated in accordance with a single 15:15:40

future minimum value of the frequency bin." 15:15:43

Q Why did you put the word "single" in that 15:15:45

sentence? 15:15:48

A Because by contrast, Martin 1993 in the case 15:15:50

of non-monetizing increasing power, stores several 15:15:58

values across subwindows, and these values are 15:16:03

basically over short time frames not corresponding to 15:16:08

the entire data window. There are multiple PMmins 15:16:13

that are being computed. 15:16:20

Q So if the claim permitted more than one 15:16:25

future minimum value, would you agree that the array 15:16:29

of PMmin values would be a future minimum value? 15:16:33

MR. LENNIE: Objection. Form. 15:16:39

A I -- the array of minimum values is not a -- 15:16:40

is not a minimum value. Any one of those values is 15:16:56

not a minimum value. 15:17:00

Q And if any one of those values is not a 15:17:05

minimum value -- 15:17:07

A Over the data window of length L. 15:17:08

Q -- would each be a minimum value over the 15:17:10

window -- the subwindow of length M? 15:17:14

A Yes. They're -- they're -- they are 15:17:18

calculations done over subwindows, yes. 15:17:21

Q And in your view, the future minimum value 15:17:25

requires that the minimum be calculated over an entire 15:17:28

window? 15:17:31

A Yes. The minimum has to be calculated over 15:17:34

an entire window or else it's not a minimum. 15:17:36

Q And a subwindow M would not be a data 15:17:39

window, in your view? 15:17:42

MR. LENNIE: Objection. Form. 15:17:44

A A subwindow M is not the entire data window 15:17:47

over which a current minimum or a future minimum would 15:17:50

be calculated. 15:17:53

Q It is a data window, though; is that 15:18:08

correct? 15:18:09

A It's a subwindow. It contains partial 15:18:12

information. 15:18:15

And I also want to point out that Martin 15:18:16

1993, we're talking about where we would have to add 15:18:20

additional -- well, it doesn't talk about frequency 15:18:23

the main processing in Martin 1993. So this is for 15:18:28

full band processing that he's referring to, so ... 15:18:33

There's additional constraints that are involved with 15:18:36

respect to this. 15:18:39

Q This algorithm would not be applied to each of the 256 channels of the filter bank? 15:18:39 15:18:42

MR. LENNIE: Objection. Form. 15:18:46

A I -- can -- can you -- can you -- I'm not sure what I'm to answer in that question. 15:18:51 15:18:55

Q On Page 1096 of Martin '93 it states, "In our experiments we used a filter bank with 256 channels and estimated the minimum power in each of these channels." 15:18:57 15:19:00 15:19:04 15:19:07

A Uh-huh. Yes. 15:19:08

Q So Martin applied his minimum estimation algorithm to each of the 256 channels of the filter bank; is that correct? 15:19:10 15:19:14 15:19:18

A That's what the words say. He -- he hasn't described the structure of the filter bank, so it's unclear what the processing is, but he indicates that he has applied his algorithm for SNR estimation to the data that he's generated. 15:19:24 15:19:27 15:19:31 15:19:34 15:19:40

Q He states that he used his algorithm for estimating the minimum power in each of these channels -- to each of the channels, correct? 15:19:42 15:19:45 15:19:48

A That's what he states, yes. 15:19:52

Q And you don't understand how the algorithm 15:19:55

would be applied to each of those channels because he 15:19:57

doesn't provide you with enough information? 15:20:00

A I don't understand how he has applied his 15:20:05

algorithm to each of these channels because he has not 15:20:07

provided the information about what he did. 15:20:11

Q So looking at his algorithm and looking at 15:20:14

the disclosure on Page 1096, you would be unable to 15:20:16

construct a system that applied Martin's algorithm to 15:20:22

each channel of the filter bank? 15:20:25

MR. LENNIE: Objection. Form. 15:20:30

A He has not described with sufficient detail 15:20:38

what exactly he is doing with respect to his 15:20:41

processing. 15:20:44

Q Based on the disclosure in Martin 1993, you 15:20:50

would be unable to make such a system? 15:20:53

MR. LENNIE: Objection. Form. 15:20:57

A I haven't been asked to consider the 15:21:01

creation of such a system. 15:21:04

Q Dr. Kyriakakis in his report did not suggest 15:21:09

the creation of such a system? 15:21:10

A (Reviewing.) 15:21:40

He has applied an algorithm to processing of 15:21:46

a sequence of values. It's unclear what those values 15:21:52

are or where they came from when he -- when he did his 15:21:56

application of his particular approach. In 15:22:01

particular, he chose W equal to one, which is not the 15:22:03

Martin 1993 system. 15:22:06

Q When you refer to "he," you were referring 15:22:16

to Dr. Kyriakakis? 15:22:18

A Yes. 15:22:19

Q So you don't understand that -- strike that. 15:22:28

It is not -- strike that. 15:22:32

Dr. Kyriakakis was not describing applying 15:22:39

the algorithm to the output of the filter bank? 15:22:41

A Can you point me to the paragraph to which 15:22:50

you refer? 15:22:52

Q You have no specific recollection of 15:22:54

Dr. Kyriakakis describing such a system? 15:22:57

Let me ask a different question. 15:23:14

You have not addressed such a system in your 15:23:16

report; is that correct? 15:23:18

MR. LENNIE: Objection. Form. 15:23:20

A My report contains rebuttal to the contentions in Dr. Kyriakakis's report. Is there something specific that you want me to address within his report? 15:23:53 15:23:55 15:24:02 15:24:04

Q I'm -- I was asking you if you had such an opinion, and it sounds like the answer is no; is that correct? 15:24:05 15:24:08 15:24:10

MR. LENNIE: Objection. Form. 15:24:11

A My report contains my opinions with regard to Dr. Kyriakakis's assertions. 15:24:12 15:24:15

Q And your report does not address a configuration of Martin 1993 where Martin 1993's algorithm is applied to each channel of a 256-channel filter bank? 15:24:18 15:24:22 15:24:27 15:24:31

A Martin 1993 describes a system which uses full band processing for SNR estimation. I provided arguments with regard to an analysis of how this functions vis-à-vis Dr. Kyriakakis's contentions. 15:24:40 15:24:43 15:24:49 15:24:52

Q If we can go back to the very exciting topic of future minimums. 15:24:56 15:24:59

If Pn(i) is the smallest of the PMmin values in the entire window, wouldn't that be the same as 15:25:04 15:25:10

using a single future minimum? 15:25:14

MR. LENNIE: Objection. Form. 15:25:22

A Again, Martin 1993 talks about SNR 15:25:28
estimation across a full band signal. So we're not 15:25:34
talking about frequency bin processing here in the 15:25:37
context of frequency bins. 15:25:40

Q I'm not asking about frequency bins, I'm 15:25:44
asking about minimum values. And so let's set aside 15:25:46
the issue of whether it's a frequency bin or not and 15:25:50
just focus on whether it's a future minimum value of 15:25:52
the signal. 15:25:55

If Pn(i) is the smallest of the PMmin values 15:25:57
in the entire window, isn't that the same as using a 15:26:03
single future minimum value? 15:26:07

A Can you point me to -- 15:26:11

MR. LENNIE: Objection. Form. 15:26:12

A Can you point me to the calculation that 15:26:13
you're talking about? I want to be specific, that's 15:26:14
the reason why. 15:26:19

Q Yes. If you look at Figure 2? 15:26:20

A Uh-huh. 15:26:22

Q On the left-hand side below the SNR 15:26:25

calculation box, Pn(i) is -- I'm sorry, that's not it. 15:26:30

It's in the bottom right-hand corner of 15:26:38

Figure 2. Pn(i) is set equal to PMmin. Do you see 15:26:40

that? 15:26:46

A I -- I do, uh-huh. 15:26:47

Q If Pn(i) in this calculation is set equal to 15:27:03

the smallest of the PMmin values in the entire data 15:27:09

window, isn't that calculation the same as using a 15:27:13

single future minimum? 15:27:16

MR. LENNIE: Objection. Form. 15:27:20

A Are you -- you're referring to this box here 15:27:30

(indicating)? 15:27:32

Q Yes. 15:27:33

A I'm sorry, I want to make sure. I'm 15:27:33

sorry -- 15:27:34

Q Yes. 15:27:34

A -- the box to the right? 15:27:34

Q That box there (indicating), yes. Pn(i) 15:27:38

equals PMmin, correct? 15:27:42

A Okay. Yes, that box says Pn(i) is equal to 15:27:43

PMmin. 15:27:47

Q And so it's setting Pn(i) equal to PMmin? 15:27:48

A That's correct. For monotonically increasing power. 15:27:53 15:27:55

Q Right. And so that would be the last PMmin in the data window? 15:27:57 15:28:02

A That's correct. 15:28:04

Q If that PMmin was the smallest value of PMmin in the data window, wouldn't the calculation in the bottom right of Figure 2 work the same as using a single future minimum? 15:28:05 15:28:09 15:28:14 15:28:21

MR. LENNIE: Objection. Form. 15:28:23

A I couldn't see how that's possible. Because the test above it says monotonically increasing power. If the power is increasing monotonically, the last PMmin would be the largest value, not the smallest value. 15:28:25 15:28:29 15:28:35 15:28:40 15:28:44

Q Okay. So if we go to the left, there's another box. 15:28:44 15:28:47

A I see that. 15:28:49

Q Pn(i) is equal to the min of the PMmin values in the vector? 15:28:50 15:28:55

A That box is a minimum of a set of values. 15:28:59

Q And this assignment will result in assigning 15:29:07

Pn(i) to the smallest of the Pmin values in the entire data window, correct? 15:29:10 15:29:16

A It results in the calculation of a Pn(i) value which is the minimum of the min vec values. 15:29:20 15:29:22

Q And the min vec values are the PMmin values, correct? 15:29:27 15:29:32

A They are the PMmin values. 15:29:33

Q So this assignment in Figure 2 of Martin assigns Pn(i) to the smallest PMmin in the data window, correct? 15:29:36 15:29:40 15:29:46

A Yes. 15:29:52

Q If the data window was segmented into four subwindows, that would be the smallest of four PMmin values, correct? 15:30:01 15:30:05 15:30:10

A That is correct. 15:30:11

Q In your view, using four minimum values is different than using a single future minimum value? 15:30:16 15:30:21

MR. LENNIE: Objection. Form. 15:30:26

A The claim language states that a current minimum is updated in accordance with a single future minimum value of the frequency bin. 15:30:36 15:30:39 15:30:42

Q So if Pn(i) was the current minimum, setting 15:30:45

it equal to the smallest of four future minimum values is outside the scope of the claim? 15:30:51 15:30:55

A I'm -- I'm confused. I'm not sure what you're saying. You used the term "current minimum." I don't see how that is appropriate here. 15:30:58 15:31:01 15:31:04

Q Assume that the value of Pn(i) is a current value. 15:31:09 15:31:14

A Assume that. 15:31:15

Q Please. 15:31:16

A But this system -- I -- 15:31:16

Q You can't -- you can't assume that? 15:31:19

A The system is working on a full band signal. 15:31:33

Q I'm not talking about the frequency bin aspect; I'm talking about the minimum value aspect. 15:31:38 15:31:39

For the purposes of evaluating the minimum value aspect of the claim, can you assume that Pn(i) is the current minimum value? 15:31:42 15:31:45 15:31:50

MR. LENNIE: Objection. Form. 15:31:52

A I don't know -- I don't know what it means to assume that something is, you know, a piece of the claim language that we're talking about. 15:31:59 15:32:00 15:32:05

Q Does the claim indicate -- does claim 4 of 15:32:25

the '345 patent indicate a time window? 15:32:27

A (Reviewing.) 15:32:41

MR. LENNIE: I'm going to object to the form of the question. 15:32:41 15:32:56

A The claim language refers to a threshold detector, the setting of a threshold detector for each frequency bin, and doing so in accordance with the current minimum value of the magnitude of the corresponding frequency bin and said current minimum value being derived in accordance with the future minimum value of the magnitude of the corresponding frequency bin. 15:32:58 15:33:04 15:33:11 15:33:12 15:33:14 15:33:20 15:33:22 15:33:25

Minimum values require that you have multiple quantities in order to perform a calculation, and in this context "frequency bin" refers to a range of values in time to allow that calculation to happen. 15:33:26 15:33:30 15:33:34 15:33:41

Q When you refer to "a range of values in time," are you referring to a frame? That the frequency bin reflects the values in a frame that's processed during FFT? 15:33:48 15:33:50 15:33:54 15:33:57

A As an example, yes. 15:33:59

Q So without a frame of an FFT, you cannot 15:34:17

have a minimum value as that term is meant within '345's claims? 15:34:21 15:34:26

MR. LENNIE: Objection. Form. 15:34:27

A There's nothing in claim 4 which restricts the processing to that of an FFT. What is required is the ability to calculate frequency bin. 15:34:36 15:34:38 15:34:45

Q So without a frame that's used in an operation that converts a signal to the frequency domain, you cannot have a minimum value as that term is meant within the '345 claims? 15:34:53 15:34:56 15:35:01 15:35:04

MR. LENNIE: Objection. Form. 15:35:08

A The minimum value is computed off of the magnitude of the corresponding frequency bin. One needs to have a time extent in order to define the minimum value from which the current minimum is found. 15:35:17 15:35:21 15:35:27 15:35:32

Q The minimum value being tracked over time? 15:35:36

A The minimum values are calculated over some time frame, yes. 15:35:42 15:35:45

Q Claim 4 does not require the minimum values to be tracked over any particular time frame, correct? 15:35:53 15:35:56

A Claim 4 does not specify a particular length of time over which one must perform a calculation. 15:36:02 15:36:05

Q Claim 4 does not specify that you must use a data window as opposed to a data subwindow, correct? 15:36:12 15:36:15

MR. LENNIE: Objection. Form. 15:36:21

A The issue of window size is in relation to how the current minimum value and the future minimum value are calculated. 15:36:31 15:36:36 15:36:39

Q So claim 4 does not specify a window versus a subwindow, correct? 15:36:49 15:36:55

MR. LENNIE: Objection. Form. 15:36:57

A A calculation over a subwindow is a partial calculation; you haven't finished the job. One must look at an entire set of samples in order to decide what a minimum is. 15:37:02 15:37:05 15:37:09 15:37:13

Q So a subwindow is not an entire set of samples in your view? 15:37:32 15:37:35

MR. LENNIE: Objection. Form. 15:37:38

A If we're talking about Martin 1993? 15:37:40

Q We were talking about the language of claim 1 -- or claim 4. 15:37:46 15:37:47

A In relation to Martin 1993? Because Martin 1993 provides context over which one is doing a calculation of an entire data window over subwindows. 15:37:50 15:37:54 15:37:58

Q But claim 4 of the '345 patent does not specify a data window, correct? 15:38:02 15:38:05

A It's -- 15:38:06

MR. LENNIE: Objection. Form. 15:38:10

A Claim 4 describes threshold detector where the setting of the threshold for each frequency bin in accordance with a current minimum value of the magnitude of the corresponding frequency bin. That current minimum value has to be performed over a set of samples. And the future minimum value of the magnitude of the corresponding frequency bin must also be computed over a set of samples. 15:38:11 15:38:20 15:38:24 15:38:26 15:38:31 15:38:33 15:38:38 15:38:41

Q Claim 4 does not specify how long that window must be, correct? 15:38:49 15:38:52

A It's understood that the current minimum and the future minimum share some relationship from the standpoint of how they're calculated. 15:38:57 15:39:00 15:39:05

One of those understandings is that the current minimum and future minimum have a same number of samples associated with them from the standpoint of minimum calculation. 15:39:09 15:39:13 15:39:17 15:39:21

Q Where does claim 4 say that? 15:39:22

A I'm providing explanation with respect to what "current minimum" and "future minimum" mean. 15:39:30 15:39:32

Q And does that reflect the language of claim 4? 15:39:36 15:39:43

A There is an understanding of what a frequency bin is. You have to be talking about -- especially for a minimum of a frequency bin, you have to be considering a time extent associated with a signal to be able to calculate that minimum. 15:39:43 15:39:44 15:39:46 15:39:49 15:39:53

Q Claim 4 does not specify a particular time extent that's used to calculate the minimum, correct? 15:39:56 15:39:58

A It does not specify that time extent. 15:40:02

Q It could be five seconds? Is one example? 15:40:06

A For example, yes. 15:40:13

Q It could be one second? 15:40:13

A It could be, yes. 15:40:18

Q Claim 4 doesn't say? 15:40:21

A It doesn't say what that choice is, but there's a relation between the current minimum and the future minimum with regard to the time extent associated with the calculation. 15:40:23 15:40:26 15:40:29 15:40:33

Q If you'll look at Martin '94 briefly. 15:40:46

A Sure. 15:40:51

Q In particular, the Abstract. Let me know 15:40:52

when you have it. The Abstract, it's the third 15:40:55

sentence. 15:41:06

"The algorithm is capable to track non 15:41:07

stationary noise signals and compares favorably with 15:41:10

standard spectral subtraction methods in terms of 15:41:13

performance and computational complexity." 15:41:17

Do you see that? 15:41:20

A I do. 15:41:20

Q Do you agree with that sentence? 15:41:21

A He's describing the performance of his 15:41:44

system in a conference paper that he's written. I 15:41:47

haven't done an analysis of the performance of this 15:41:51

system with respect to other systems to try to decide 15:41:54

whether his claim is reasonable. 15:41:57

Q You agree that he claims that his system is 15:42:01

capable of tracking non-stationary noise, correct? 15:42:04

A I do. 15:42:07

Q And you agree that he claims that his system 15:42:08

compares favorably with standard spectral subtraction 15:42:11

methods in terms of performance and computational 15:42:14

complexity? 15:42:17

A I agree that he claims that. 15:42:18

Q As a person of ordinary skill in the art reading this article, would you be inclined to consider this article for an algorithm that has the features that he describes in his Abstract? 15:42:25 15:42:28 15:42:31 15:42:35

A In what context? 15:42:41

Q Let's say you were looking to implement a spectral subtraction noise reduction system. Can you assume that? 15:42:55 15:42:57 15:43:04

A I'm not sure what would drive me to go to this particular paper to consider that. 15:43:05 15:43:07

Q My question isn't whether you would go to this paper to begin with, it was whether you could assume that hypothetical? 15:43:11 15:43:13 15:43:15

A Can you repeat the hypothetical? 15:43:17

Q Yes. Can you assume that you are a person of ordinary skill in the art looking to implement a spectral subtraction noise reduction system? 15:43:19 15:43:21 15:43:26

A Okay. I am assuming that now. 15:43:29

Q Let's assume that you have a pile of papers in front of you that have to do with spectral 15:43:31 15:43:34

subtraction. Can you do that? 15:43:38

A Okay. 15:43:41

Q For example, you selected these because they used the words "spectral subtraction" in the title, as one hypothetical. 15:43:41 15:43:43 15:43:46

A That's -- that's one possibility, yes, as a hypothetical, sure. 15:43:46 15:43:49

Q And you were evaluating features that you might want to incorporate into your system. 15:43:50 15:43:53

A Okay. 15:43:57

Q Reading Martin 1994's Abstract, would you understand his system to be one possible way to implement an algorithm that can track non-stationary noise and that compares favorably with standard spectral subtraction methods in terms of performance and computational complexity? 15:43:57 15:44:02 15:44:06 15:44:09 15:44:14 15:44:16

A I would understand that he would state that and that might factor into the evaluation of this paper and the other papers in the pile but, you know, sitting here today, it's not obvious that I would pick up this particular paper as the choice, particularly since I don't have the other papers with which to 15:44:19 15:44:23 15:44:26 15:44:30 15:44:33 15:44:37

compare. 15:44:40

Q But if you were looking through the articles 15:44:41

and you were interested in an algorithm that could 15:44:43

track non-stationary noise, you might consider the 15:44:48

Martin 1994 article based on his statements in the 15:44:52

Abstract? 15:44:55

MR. LENNIE: Objection. Form. 15:44:56

A I have to have a need to be able to consider 15:45:00

that. If I don't have the need for it, then I don't 15:45:03

see the reason to do it. 15:45:06

Q If that were a feature you were looking for, 15:45:15

would you evaluate Martin 1994 in more depth to 15:45:19

determine whether his statement in the Abstract is 15:45:23

true? 15:45:25

A I'm -- I'm not sure, because there could be 15:45:26

other papers in the pile that have a similar feature 15:45:28

and those other papers may have other desirable 15:45:30

aspects. It would depend upon the situation, and 15:45:34

sitting here today, I don't know if I could make that 15:45:37

choice. 15:45:40

Q Okay. 15:45:41

MR. BROUGHAN: Please mark this as the next 15:45:58

exhibit. 15:45:59

(Exhibit 11 was marked for identification and is attached to the transcript.) 15:46:00 15:46:01

Q Do you recognize this document? 15:46:14

A I do. 15:46:15

Q Is this a patent on which you are a named inventor? 15:46:17 15:46:21

A I am. 15:46:21

Q Have you read the document before? 15:46:22

A Yes, I have. 15:46:25

Q Would you please turn to column 1. 15:46:26

A (Complying.) 15:46:38

Q For -- in most of column 1 and column 2 there is a list of references, correct? 15:46:39 15:46:41

A Yes. 15:46:45

Q And in the patent you state that this list of 20 references is a list of the various technologies referenced and described in the patent, correct? 15:46:47 15:46:53 15:46:56

A These are methods that -- that were used to evaluate the technique -- that were used to determine information that enabled us to -- to design systems with respect to our speech enhancement technique. 15:47:17 15:47:20 15:47:28 15:47:32

Q Did you intend for the reader to pick up these articles for more information about the systems used in your article? Or in your patent, excuse me. 15:47:42 15:47:45 15:47:48

MR. LENNIE: Objection. Form. 15:47:52

A They represented recommendations for things to look at from the standpoint of providing some context to understand the processing. 15:48:03 15:48:06 15:48:08

Q Would you consider your patent in combination with the references listed in columns 1 and 2 of your patent? 15:48:14 15:48:18 15:48:21

A In what context? 15:48:27

Q Did you expect the reader to consider your patent in combination with the references listed in columns 1 and 2 of your patent? 15:48:35 15:48:37 15:48:41

MR. LENNIE: Objection. Form. 15:48:44

A Did I expect the reader? Is that what -- I'm sorry, could you repeat the question? 15:48:46 15:48:49

Q By listing these 20 references in columns 1 and 2 of your patent, was it your intention to allow the reader to consider your patent in combination with these references? 15:48:57 15:49:02 15:49:06 15:49:10

MR. LENNIE: Objection. Form. 15:49:13

A The reason for combining references is driven by the system implementer, the person who chooses to build the system. 15:49:21 15:49:28 15:49:32

Q If you were a person of ordinary skill in the art reading your patent, would you consider this patent in combination with the 20 references listed in columns 1 and 2 of the patent? 15:49:36 15:49:38 15:49:44 15:49:48

MR. LENNIE: Objection. Form. 15:49:51

A Again, to solve what problem? I -- I -- I need more context to understand the nature of the question. 15:49:53 15:49:55 15:49:58

Q Would you consider them together? 15:50:00

A I'm -- I'm not sure why I'd want to consider them together. 15:50:03 15:50:06

Q If you wanted more information -- sorry, I didn't mean to cut you off. 15:50:08 15:50:10

A Well, I -- I just -- I don't know why -- I don't understand the reason why I'm wanting to consider these together. The reason that you're providing. 15:50:11 15:50:13 15:50:18 15:50:25

Q So looking in columns 1 and 2 of your patent, there'd be no reason for you to pick up any of 15:50:26 15:50:29

the 20 references that are listed here and consider them? 15:50:34 15:50:37

A The reasons to consider the combination of these references or other technology that's not listed here would not be found within this patent, it would be found within the application to which this particular technology would -- would be applied. 15:50:42 15:50:44 15:50:47 15:50:50 15:50:52

Q So if a patent like yours listed 20 references, you would not be motivated in any way to pick up one of those references and read it? 15:50:58 15:51:01 15:51:06

MR. LENNIE: Objection. Form. 15:51:11

A Again, the motivation to pick up a reference is driven by the application and the need of the designer. 15:51:15 15:51:17 15:51:20

Q So if you wanted more information about a technique described in your patent, you wouldn't go to one of these 20 references to fill in those details? 15:51:25 15:51:28 15:51:31

A The patent employs references, it provides background information. If a person looking at technology needs the background information, they may go to that to determine more information. That would be a reasonable reason to go look at references. 15:51:44 15:51:48 15:51:52 15:51:55 15:51:58

That's a pretty common thing to do both in patents as well as in technical papers. 15:52:02 15:52:06

Q If you wanted more information about a technique described in the paper, you might consult the references that are cited by the paper? 15:52:09 15:52:11 15:52:14

A That's correct. 15:52:17

Q If you look at the bottom of column 2? 15:52:24

A Uh-huh. 15:52:27

Q Lines approximately 60 to 65, you describe spectral subtraction? 15:52:27 15:52:38

A (Reviewing.) 15:52:43

Uh-huh, yes. 15:52:46

Q Do you agree that spectral subtraction is a simple and popular single-channel speech enhancement technique? 15:52:47 15:52:49 15:52:54

A Yes. 15:52:54

MR. LENNIE: Objection. Form. 15:52:59

A It is a simple and popular technique. It can be used in various applications. It depends on the application. 15:53:00 15:53:03 15:53:08

Q You agree that spectral subtraction is a popular technique? 15:53:10 15:53:12

MR. LENNIE: Objection. Form. 15:53:14

A It can be used in many different contexts, many different systems. The type of systems that would use them, you know, would -- they would have to have a need for them, but it is a technique that is used. 15:53:30 15:53:33 15:53:38 15:53:44 15:53:47

Q In your patent you state that spectral subtraction is a popular speech enhancement technique, correct? 15:53:54 15:53:57 15:54:01

A It states that, "Spectral subtraction is a simple and popular single channel speech enhancement technique that achieved marked reduction in background noise." 15:54:08 15:54:10 15:54:13 15:54:21

Q Are you able to answer my question, that spectral subtraction -- whether spectral subtraction is a popular technique with a yes or no answer? 15:54:26 15:54:30 15:54:31

MR. LENNIE: Objection. Form. 15:54:38

A Without having some information about the context or the types of systems in which it's in, it's not clear that one could easily say yes or no to that question. 15:54:43 15:54:45 15:54:49 15:54:52

Q And in your patent you cite to Boll for 15:55:12

information about spectral subtraction; is that correct? 15:55:18 15:55:20

A Yes, I do. 15:55:21

Q So a reader who might want more information about spectral subtraction might go look at Boll? 15:55:23 15:55:27

A Within this particular patent and technique, it certainly would make sense in particular because we've referenced it. 15:55:39 15:55:42 15:55:45

Q If you had not referenced the Boll article, would a person of ordinary skill in the art had reason to go look at the Boll article for more information about spectral subtraction? 15:56:00 15:56:05 15:56:09 15:56:12

MR. LENNIE: Objection. Form. 15:56:15

A Again, in what context? I want to be precise. 15:56:16 15:56:19

Q The context is reading your patent. 15:56:19

A Okay. 15:56:22

Q We're deleting the reference to Boll. 15:56:22

If a person of ordinary skill in the art wanted to know more about spectral subtraction as described here in column 2 of your patent, would they have had reason to go look at the Boll article? 15:56:24 15:56:28 15:56:31 15:56:35

A This particular spatio-temporal speech enhancement technique is not focused on spectral subtraction. There's no particular feature or need for it with respect to its processing. 15:56:47 15:56:50 15:56:54 15:56:59

If the reference weren't there, it wouldn't be the case that someone would say, I need to go to that particular reference in order to figure out that type of system. 15:57:02 15:57:05 15:57:09 15:57:12

What I mean is that particular reference, assuming that it's not there. 15:57:21 15:57:23

Q Why did you choose to cite to the Boll article for more information about spectral subtraction? 15:57:29 15:57:32 15:57:34

A It was one of the first articles on spectral subtraction using digital techniques to be published. 15:57:36 15:57:39

Q You selecting Boll as the reference for more information about spectral subtraction seemed like a natural choice? 15:57:47 15:57:50 15:57:54

A For purposes of describing the methods in the introductory portion of this particular patent, it made sense to provide a foundational reference in order to orient the reader on the general set of 15:58:00 15:58:04 15:58:08 15:58:12

techniques associated with spectral subtraction. 15:58:15

Q You agree that the Boll article is a 15:58:19

foundational reference that describes spectral 15:58:22

subtraction? 15:58:25

A It is a reference, as I said, that is one of 15:58:29

the first that provides implementation methods using 15:58:33

digital techniques. 15:58:39

Q Is the Boll article well known in your 15:58:40

field? 15:58:53

A So my research, I work on various problems 15:59:04

in terms of the types of things that I process. With 15:59:08

respect to audio signals, there's work I do in 15:59:11

microphone arrays, I've also done work in active noise 15:59:16

control and adaptive filters. Depending upon the 15:59:19

application, it may or may not require knowledge of 15:59:22

Boll in order to implement things. 15:59:28

Certainly it may not be the case that people 15:59:30

working in these fields would necessarily go to Boll 15:59:34

because spectral subtraction may not be important to 15:59:39

them. 15:59:41

Q If a paper referenced spectral subtraction 15:59:59

in combination with a noise reduction technique, would 16:00:03

you consider going to look at the Boll article? 16:00:08

MR. LENNIE: Objection. Form. 16:00:12

A So you used the words "the paper referenced spectral subtraction," and I want to make sure that it's clear that we're not talking about a reference, we're talking about mention, for example. 16:00:14 16:00:19 16:00:21 16:00:24

Q Right. So for example, the Martin 1994 article has the -- uses the term "spectral subtraction," correct? 16:00:29 16:00:32 16:00:35

A Correct. 16:00:36

Q Based on Martin 1994's reference to spectral subtraction, might you go look at the Boll article about spectral subtraction? 16:00:39 16:00:42 16:00:46

MR. LENNIE: Objection. Form. 16:00:49

A If you're talking about the implementation of the method in Martin -- 16:00:51 16:00:53

Q I'm not talking about the implementation method in Martin. 16:00:55 16:00:58

A Okay. 16:00:58

Q As a person of ordinary skill reading Martin -- 16:00:59 16:01:01

A Yes. 16:01:02

Q -- you see the words "spectral subtraction," correct? 16:01:02 16:01:04

A I do. 16:01:05

Q And if you were not completely familiar with that technique, you might go look at the Boll article for more information about it, correct? 16:01:06 16:01:10 16:01:13

MR. LENNIE: Objection. Form. 16:01:15

A Well, the Boll article would be one of several that I might consider. It wouldn't be a necessary thing that I'd have to go to. 16:01:17 16:01:22 16:01:26

Q But you might consider it? 16:01:29

A Again, I would have to have a need to do so, and that need would have to be driven by something in an application. Again, hypothetically speaking. It's not clear what exactly is going to be required when you're trying to build a system to solve a particular problem. 16:01:36 16:01:38 16:01:42 16:01:45 16:01:48 16:01:51

Q Do you know what a whitening filter is? 16:01:56

A I do. 16:02:00

Q Does a whitening filter spread the spectrum of a microphone signal more evenly across the bandwidth of the microphone signal? 16:02:01 16:02:04 16:02:08

A Is there particular language that you're pointing to? 16:02:12 16:02:14

Q Your patent discusses a whitening filter, and I am asking you if I'm accurately describing what a whitening filter is? 16:02:17 16:02:21 16:02:24

A Ah, okay. So you're saying in the context of my patent. 16:02:26 16:02:29

Q Does the term "whitening filter" have a meaning to you? 16:02:31 16:02:32

A It does. 16:02:33

Q What is a whitening filter? Let's talk about generally -- 16:02:36 16:02:40

A Sure. 16:02:41

Q -- instead of in the context of your patent. Can you -- sorry. 16:02:42 16:02:44

A Generally, a white -- it depends on the nature of the signals being processed and also the underlying assumptions of those signals. 16:02:46 16:02:47 16:02:53

Whitening, in the context of signal processing, could be over time, it could actually be over channel as well. It generally involves taking a system and making the power or level of a signal in 16:02:56 16:02:59 16:03:04 16:03:12

the system more or less equal across different channels and across different samples and/or frequencies, as it turns out. It depends on the resulting system. 16:03:20 16:03:25 16:03:28 16:03:32

MR. BROUGHAN: Do you want to take a quick break? 16:03:48 16:03:49

THE WITNESS: Sure, we can take a break. 16:03:51

THE VIDEOGRAPHER: Going off the record. The time is 4:04. 16:03:52 16:03:52

(A recess was taken.) 16:03:54

THE VIDEOGRAPHER: Here begins Tape No. 4. We're back on the record at 4:20. 16:20:44 16:20:45

BY MR. BROUGHAN: 16:20:51

Q Would you get out the '345 patent, please. 16:20:51

A Okay. 16:20:54

Q And look at claim 1? 16:21:02

A Uh-huh. 16:21:06

Q Claim 1 recites three limitations, correct? 16:21:10

A It has, "An apparatus for canceling noise, comprising" and then three different sections below that. 16:21:17 16:21:20 16:21:24

Q You agree that an apparatus must include all 16:21:26

three limitations to anticipate claim 1? 16:21:30

A Yes. 16:21:38

Q You agree that if an apparatus does not contain one of the limitations it does not anticipate claim 1? 16:21:43 16:21:46 16:21:50

A Yes. And if it doesn't include 2 and if it doesn't include 3. 16:21:54 16:22:02

Q Prior to this patent, an apparatus for canceling noise existed; is that correct? 16:22:14 16:22:17

A There were systems for canceling noise, yes. 16:22:21

Q Andrea doesn't have a patent on all systems for canceling noise, correct? 16:22:26 16:22:29

A All systems that cancel noise. Can you give me a context? That's pretty broad. 16:22:34 16:22:38

Q There can exist an apparatus that cancels noise that does not practice claim 1 of the '345 patent? 16:22:40 16:22:43 16:22:48

A Correct. Yes. 16:22:54

Q Andrea didn't invent the concept of spectral subtraction, did it? 16:23:14 16:23:16

A Again, the concept of spectral subtraction is fairly broad. 16:23:17 16:23:24

Q Boll describes spectral subtraction, correct? 16:23:27 16:23:28

A Boll describes a technique for spectral subtraction. I think the idea of having a concept of a spectral subtraction is perhaps even broader than that. 16:23:30 16:23:32 16:23:36 16:23:40

Q Claim 1 doesn't cover the Boll patent -- strike that. 16:23:41 16:23:44

Claim 1 doesn't cover the Boll reference, does it? 16:23:46 16:23:48

A Yeah, again, what do you mean by "cover"? 16:23:55

Q Boll doesn't anticipate claim 1 of the '345 patent, in your opinion? 16:23:57 16:24:01

A Boll does not anticipate claim 1 associated with the system. 16:24:13 16:24:16

Q Does Boll anticipate any other claim of the '345 patent? 16:24:18 16:24:22

A Sorry, I want to make sure that I have -- 16:24:41

Q Do you think you offered an opinion that Boll anticipated claim 1 or any of the claims of the '345 patent? 16:24:43 16:24:45 16:24:49

A No, I did not. 16:24:49

Q Okay. 16:24:51
A But I wanted to make sure that I had the 16:24:51
sections available should you -- should you become 16:24:53
more specific in your -- in your desire for 16:24:55
information. 16:25:00
Q Andrea didn't invent every sys- -- strike 16:25:11
that. 16:25:14
Claim 1 of the '345 patent covers a system 16:25:23
that in part estimates a noise -- estimates noise, 16:25:27
correct? 16:25:32
A It certainly uses a threshold detector for 16:25:40
setting a threshold for each frequency bin using a 16:25:46
noise estimation process. 16:25:48
Q Systems can use a noise estimation process 16:25:55
without practicing claim 1 of the '345 patent? 16:25:57
A A noise estimation process is useful for 16:26:07
many different types of systems. A system can use 16:26:10
noise estimation in its processing, certainly. 16:26:13
Q And some of those systems do not practice 16:26:17
claim 1 of the '345 patent, correct? 16:26:20
A Certainly some of those systems can. 16:26:26
Q Some of those systems do not practice claim 16:26:34

1 of the '345 patent? 16:26:36

A Again, some of those systems can. We -- 16:26:40

we'd have to look at particular systems in order to 16:26:43

decide whether it does or it doesn't. 16:26:45

Q So if a system estimates noise, it 16:26:49

necessarily practices claim 1 of the '345 patent? 16:26:54

MR. LENNIE: Objection. Form. 16:26:57

A No. It's not the case that existence of a 16:27:00

noise estimator implies that it's practicing claim 1. 16:27:04

The noise estimation process is used to set a 16:27:10

threshold detector for -- sorry, it's used in a 16:27:14

threshold detector for setting a threshold for each 16:27:16

frequency bin in claim 1. 16:27:21

Q Could a prior art reference disclose a 16:27:26

threshold yet not disclose the threshold detector of 16:27:29

claim 1? 16:27:34

A The question -- it's a hypothetical question 16:27:44

because it's not clear -- I would have to see the 16:27:46

language of the particular reference to decide what 16:27:49

"threshold" means. 16:27:52

A threshold detector is pretty clear. The 16:27:55

term "threshold" is -- is something that's used in a 16:27:57

way specifically in the '345 patent. I certainly wouldn't want to claim that somebody using a word means that they have a particular feature of '345. 16:28:01 16:28:06 16:28:08

Q The Hirsch article describes an adaptive threshold, correct? You don't have it. 16:28:14 16:28:17

MR. BROUGHAN: Please mark this as the next exhibit. 16:28:40 16:28:41

(Exhibit 12 was marked for identification and is attached to the transcript.) 16:28:42 16:28:43

Q If you look on the right-hand column, middle paragraph, "In contrast to these approaches an adaptive threshold is introduced here." 16:28:47 16:28:49 16:28:53

A Yes. That -- that is what Hirsch says in his paper. 16:28:58 16:29:02

Q Is it your opinion that Hirsch does not disclose the thresh- -- the threshold detector of claim 1 of the '345 patent? 16:29:12 16:29:14 16:29:18

A It does not disclose the threshold detector of claim 1. 16:29:20 16:29:23

Q A reference could use a threshold yet not disclose the threshold detector of claim 1? 16:29:27 16:29:32

A The threshold detector of claim 1 has 16:29:35

additional limitations for setting a threshold for each frequency bin using a noise estimation process. 16:29:39 16:29:41

Q So if you set a threshold without using a noise estimation process, that would not practice claim 1 of the '345 patent? 16:29:44 16:29:47 16:29:50

MR. LENNIE: Objection. Form. 16:29:55

A Just because one particular feature -- I'm sorry, could you repeat the question? 16:29:58 16:30:04

Q If a reference set a threshold without using a noise estimation process, would that reference disclose claim 1 of the '345 patent? 16:30:07 16:30:10 16:30:13

MR. LENNIE: Same objection. 16:30:21

A I'm sorry, if you could repeat the question, I apologize. It's legal terminology and I want to make sure that I'm understanding it correctly. 16:30:46 16:30:48 16:30:51

Q If a reference disclosed a system that set a threshold without using a noise estimation process, would that reference disclose claim 1 of the '345 patent? 16:30:53 16:30:58 16:31:02 16:31:05

MR. LENNIE: Objection. Form. 16:31:08

A Again, we're speaking in a hypothetical way. One would have to examine the reference to determine 16:31:13 16:31:18

that the reference is implementing a threshold detector for setting a threshold for each frequency bin using a noise estimation process and, in addition, having these other limitations. 16:31:22 16:31:25 16:31:29 16:31:31

It would also have the other limitations as well in terms of the input -- for inputting the system -- or signal as well as a frequency spectrum generator. 16:31:35 16:31:37 16:31:42 16:31:44

Q Claim 1 requires a threshold to be set using a noise estimation process? 16:31:48 16:31:51

A It requires setting a threshold for each frequency bin using a noise estimation process. 16:32:01 16:32:04

Q If for each frequency bin the threshold was always set to a particular value, would that disclose setting a threshold using a noise estimation process? 16:32:06 16:32:10 16:32:15

MR. LENNIE: Objection. Form. 16:32:18

A I don't understand the operation of setting a threshold to a particular value. Without some form of context, I can't really evaluate the question. 16:32:20 16:32:23 16:32:27

Q If you look at Hirsch, it sets an adaptive threshold for each frequency bin, correct? 16:32:35 16:32:41

A It sets a threshold. 16:32:50

Q Hirsch calls it an adaptive threshold. 16:32:54

A Correct, he calls it an adaptive threshold, yes. 16:32:57 16:33:00

Q And the adaptive threshold is set as the noise estimate Ni hat (k) times an overestimation factor beta, correct? 16:33:00 16:33:04 16:33:12

A No. The threshold is Ni hat (k -1) times beta. The value is used to determine when the actual spectral component X(i) exceeds the threshold to determine a rough detection of speech. And it stops the recursive accumulation. 16:33:17 16:33:25 16:33:34 16:33:39 16:33:43

Q What is Ni hat (k -1)? 16:33:45

A Ni hat k is an estimation of the noise magnitude. Ni hat (k -1) is its previous value. 16:33:54 16:33:58

Q If the threshold is beta times the noise estimate, you agree that the threshold is set using a noise estimation process? 16:34:08 16:34:11 16:34:15

MR. LENNIE: Objection. Form. 16:34:20

A To understand how Hirsch works, he has a statement, "The simple processing is illustrated in figure 1 as part of a complete noise reduction scheme," as part of that paragraph. 16:34:26 16:34:31 16:34:33 16:34:36

Q Uh-huh. 16:34:38
A And I'm informed about how it works by 16:34:38
looking at Figure 1. 16:34:42
Q Are you informed about how it works by the 16:34:46
text in column 2 on Page 153 of Hirsch? 16:34:48
A Yes, but to understand it fully, Figure 1 16:34:52
enables me to determine what is meant by the 16:34:57
description in the paper. 16:35:01
Q If you stay on Page 153, the bottom 16:35:12
right-hand column? 16:35:17
A Uh-huh. 16:35:20
Q Beta is an overestimation factor; is that 16:35:22
correct? 16:35:25
A He refers to it as an overestimation factor, 16:35:26
beta. 16:35:30
Q And he multiplies N hat i by the 16:35:31
overestimation factor beta? 16:35:34
A He does. 16:35:37
Q And Hirsch subtracts from Xi the value of 16:35:42
beta times N hat i, correct? 16:35:50
A That is correct; although, to be clear, the 16:35:57
quantity being subtracted is beta times Ni hat (k -1). 16:36:02

This is what Figure 1 shows on the next page. 16:36:09

Q In your view, is beta times Ni hat (k -1) a threshold within the meaning of the '345 claim 1? 16:36:18 16:36:22

A No, it's not. 16:36:27

Q Why not? 16:36:30

A Well, it's being used to subtract a noise estimate from X(i) to produce an estimate S i -- of hat in this case -- of the clean speech, as he describes in the text as well. But as shown in Figure 1. 16:36:41 16:36:48 16:36:54 16:36:59 16:37:02

The test that he uses is to determine whether X i minus beta times Ni hat (k -1) is greater than zero. And this is the test that he uses, at which point this detects the onset of speech. 16:37:05 16:37:09 16:37:19 16:37:22

Q In that test, is beta times Ni hat and k -1 a threshold? 16:37:27 16:37:35

A It's not. It's being used to subtract -- sorry. It's being used to subtract from X i hat, and it is a value that is employed to both determine whether the system stops adjusting, thereby stopping the method of estimation, and to remove the resulting value from the original spectral magnitude to estimate 16:37:39 16:37:41 16:37:49 16:37:56 16:38:02 16:38:08

the clean speech. 16:38:14

Q Hirsch removes the value beta times Ni hat k -1 from the signal magnitude Xi, correct? 16:38:17 16:38:21

A He does. 16:38:28

Q And then he compares that value to zero, correct? 16:38:29 16:38:33

A He does. 16:38:34

Q In that comparison, is zero a threshold within the meaning of the '345 claim 1? 16:38:37 16:38:41

A It's not because zero is not set using the noise estimation process. Zero is zero. 16:38:49 16:38:53

Q So Hirsch describes two algorithms for estimating the noise level in a signal, correct? 16:39:07 16:39:12

A He has a second approach as well. 16:39:20

Q The first approach is called the weighted average approach? I'll direct you to -- 16:39:26 16:39:29

A Yes. 16:39:37

Q -- the Introduction section. 16:39:38

A He refers to the first approach as the weighted average approach and the second, a histogram technique. 16:39:39 16:39:41 16:39:45

Q If you turn to Page 154, there's a heading 16:39:51

"Recognition of Noisex Data"? 16:39:57

A I see it. 16:40:02

Q All right. Hirsch is describing a series of experiments involving speech recognition in this section, correct? 16:40:03 16:40:08 16:40:13

A Yes, he's -- he's looking at the problem of speech recognition using hidden Markov models. That's what "HMM" means. 16:40:21 16:40:24 16:40:30

Q And near the end of this last paragraph on Page 154 he states, "Both above mentioned estimation techniques are applied to the nonlinear spectral subtraction as a preprocessing step to recognition." 16:40:31 16:40:33 16:40:38 16:40:42

Correct? 16:40:46

A Yes, I can see that. He states this. 16:40:47

Q So Hirsch combined his algorithms with a speech recognition system? 16:40:50 16:40:56

A He -- it appears that he did and he reports on it. 16:40:59 16:41:02

Q If you flip over to Page 155. Below the figure? 16:41:03 16:41:09

A Uh-huh. 16:41:10

Q Hirsch is describing improvements that were 16:41:15

made to the noise recognition -- strike that. 16:41:18

Hirsch is describing improvements that were 16:41:21

made to the speech recognition system? 16:41:23

A He is describing improvements that can be 16:41:28

achieved. 16:41:31

Q And they can be achieved by integrating his 16:41:33

noise estimation techniques into those systems, 16:41:35

according to him, correct? 16:41:38

A He is; although, he's also stating the 16:41:49

detection of speech pauses as implemented to obtain 16:41:52

these results. So he's doing multiple modifications. 16:41:55

Q And Hirsch says, "The detection is based on 16:42:01

the evaluation of all the SNRs and all subbands." 16:42:04

What does "SNRs" mean in that sentence? 16:42:09

A It means signal-to-noise-ratios. He -- 16:42:17

typically when you're using an acronym, one would 16:42:21

actually use it before and define it, but "SNR" 16:42:24

generally means signal-to-noise-ratio. 16:42:28

Q And he's describing signal-to-noise-ratio as 16:42:31

the ratio of N divided by X? 16:42:41

A It's not clear. He hasn't actually given an 16:42:45

equation for it here. 16:42:49

Q If you read the -- it's right below the figure, the last sentence before equation 3. "A relative measure of NXrel of the ratio N divided by X (noise to noise & signal) is calculated for each subband." 16:42:50 16:42:54 16:42:57 16:43:01 16:43:05

A Ah, yes. Actually, he -- he's defined an Xrel, which is noise to noise and signal. This is a little different than signal to noise. So he's been rather specific in the equation -- in the specification of what NXrel means here. 16:43:05 16:43:12 16:43:20 16:43:25 16:43:28

Q If you follow after equation 3 he states that the values NXmin and NXmax are determined from past segments of about 600 milliseconds? 16:43:46 16:43:49 16:43:54

A I see that. 16:43:58

Q So Hirsch has integrated his algorithm into a system that calculates the noise estimate from past segments of about 600 milliseconds? 16:44:00 16:44:03 16:44:08

A Again, it's not clear from the description here that he has. The fact that he's mentioned the detection of speech pauses and he said that he needs that to obtain these results, I'm not sure if the speech pauses are important, and the detection of 16:44:17 16:44:19 16:44:24 16:44:28 16:44:32

those speech pauses are important to obtain what he's -- what he's produced here. 16:44:36 16:44:38

Q If you look back to claim 1 of the '345 patent. What does it mean to "thereby detecting the position of noise elements for each frequency bin"? 16:45:26 16:45:29 16:45:38

A (Reviewing.) 16:45:54

The '345 patent describes an interpretation of this particular statement in the specification. It says, "In the preferred embodiment" -- and I'm reading from column 3, line 28 -- "the present invention obviates the need for a voice switch by precisely determining the non-speech segments using a separate threshold detector for each frequency bin. The threshold detector precisely detects the positions of the noise elements, even within continuous speech segments, or by determining whether frequency spectrum elements, or bins, of the input signal are within a threshold set ..." 16:46:03 16:46:10 16:46:14 16:46:17 16:46:20 16:46:24 16:46:27 16:46:30 16:46:33 16:46:37 16:46:40 16:46:45

And we could talk about how it's set. 16:46:46

Q That's your understanding of what "detecting the position of noise elements for each frequency bin" means? 16:46:48 16:46:51 16:46:54

A That's what's described in the preferred embodiment in the '345 patent. It shows an example of how the detection could be done. 16:46:55 16:46:57 16:47:00

Q Does detecting the position of noise elements for each frequency bin require a binary decision as to whether the frequency bin contains noise or not? 16:47:03 16:47:05 16:47:08 16:47:11

MR. LENNIE: Objection. Form. 16:47:14

A A threshold detector is generally a decision and that decision is -- a decision is generally binary valued. It's not restricted to a single binary value from the standpoint of having a threshold detector -- sorry, having a threshold detector has a single binary value, but the presence of a sing- -- of a threshold detector is what's needed for '345 patent. 16:47:33 16:47:35 16:47:42 16:47:48 16:47:52 16:47:58 16:48:06

Q For a threshold detector to detect the position of noise elements for each frequency bin, does it need to make a noise/no noise decision with respect to each frequency bin? 16:48:09 16:48:12 16:48:15 16:48:19

MR. LENNIE: Objection. Form. 16:48:23

A It needs to make a noise/no noise decision and be able to use that. It could use a system which 16:48:27 16:48:35

calculates a noise decision. 16:48:51

Q What is a system that calculates -- 16:49:00

A Sorry, I'm not done yet. 16:49:02

Q Sorry. 16:49:04

A Depending upon different thresholds. So it could include a system which has a threshold detector but in combination with a -- for example, a second threshold detector. 16:49:05 16:49:10 16:49:22 16:49:26

Q Does the threshold detector -- strike that. 16:49:40

Does the threshold detector of claim 1 of the '345 patent require the use of a single threshold? 16:49:55 16:49:58

A Again, I would have to have some context; i.e., something to look at to decide. One can't simply say yes, it must be one. One has to see the nature of the system and how it processes the resulting signals in order to make that determination. 16:50:09 16:50:13 16:50:19 16:50:23 16:50:26

Q Does the apparatus of claim 1 require setting a single threshold for each frequency bin using a noise estimation process? 16:50:51 16:50:57 16:51:02

MR. LENNIE: Objection. Form. 16:51:06

A Again, one would want to look at what the system is to try to make a decision, but it does not 16:51:12 16:51:14

require a single threshold. 16:51:17

Q Claim 1 of the '345 patent does not require a single threshold that is set using a noise estimation process. 16:51:22 16:51:25 16:51:28

MR. LENNIE: Objection. Form. Is that a question? 16:51:31 16:51:36

MR. BROUGHAN: It's a bad question. Let me strike that. 16:51:37 16:51:39

A Yeah, I'm -- I'm trying to interpret -- 16:51:39

Q Yeah, I'll -- 16:51:41

A Okay, thank you. 16:51:42

Q I will attempt to fix it. 16:51:50

Earlier you testified that claim 4 was limited to a system that had a single future minimum value. Is that correct? 16:51:55 16:51:58 16:52:03

A It was in the context of the analysis of one of the Martin references where we were considering how that processing was being done. In the context of that processing, the multiple values that were being computed, none of those were future minimum. 16:52:15 16:52:21 16:52:25 16:52:30 16:52:33

Q The term "a future minimum value" in claim 4 is not limited to being a single future minimum value, 16:52:45 16:52:49

correct? 16:52:52

MR. LENNIE: Objection. Form. 16:53:01

A (Reviewing.) 16:53:19

With regard to claim 4, the current minimum value is being derived in accordance with a future minimum value. So there's a correspondence between a current minimum value and a future minimum value. 16:53:28 16:53:32 16:53:34 16:53:39

Q Do you have an opinion as to whether claim 4 of the '345 patent is limited to requiring a single future minimum value? 16:53:46 16:53:49 16:53:55

MR. LENNIE: Objection. Form. 16:53:57

A There is a correspondence between the current minimum value and a future minimum value. 16:54:02 16:54:04

Q So because there's the correspondence to the future minimum value and the current minimum value, in your view, that means there's one of each? 16:54:06 16:54:09 16:54:13

MR. LENNIE: Objection. Form. 16:54:16

A It's -- there may not necessarily be one of each, but for each current minimum value there is a corresponding future minimum value. 16:54:17 16:54:33 16:54:37

Q You agree, then, that claim 4 of the '345 patent covers a system with multiple future minimum 16:54:46 16:54:48

values? 16:54:53

MR. LENNIE: Objection. Form. 16:54:56

A Again, I would have to examine what that system is. It's unclear the operation of the system speaking hypothetically. 16:54:57 16:55:01 16:55:06

Q Based on the language of claim 4 of the '345 patent, you cannot say whether it encompasses a system that uses more than one future minimum value? 16:55:14 16:55:17 16:55:21

MR. LENNIE: Objection. Form. 16:55:26

A The system must have a current minimum value and it must be derived in accordance with a future minimum value. So it must have a current minimum value. There is a correspondence to the future minimum value which is being used to derive the current minimum value. 16:55:37 16:55:40 16:55:43 16:55:47 16:55:50 16:55:55

Q So claim 4 is limited to a system that has a single current minimum value and a single future minimum value? 16:56:02 16:56:07 16:56:10

A No -- 16:56:12

MR. LENNIE: Objection. Form. 16:56:14

A -- no. Claim 4 describes a system where a threshold detector of the system sets the threshold 16:56:14 16:56:24

for each frequency bin in accordance with a current minimum value, said current minimum value being derived in accordance with a future minimum value. There is a correspondence between a current minimum value and its corresponding future minimum value. 16:56:27 16:56:30 16:56:34 16:56:38 16:56:42

Q Claim 4 requires a single threshold, a single current minimum value, and a single future minimum value? 16:56:48 16:56:51 16:56:54

MR. LENNIE: Objection. Form. 16:56:55

A Again, there's no -- there's not a term here that says "single" in the resulting claim, so I don't understand why that particular word is being used here. 16:56:58 16:57:01 16:57:06 16:57:08

Q The teachings of the '345 patent require that the current minimum for each frequency bin be derived in accordance with a single future minimum of the corresponding frequency bin. 16:57:19 16:57:23 16:57:25 16:57:29

Do you agree with that statement? 16:57:32

MR. LENNIE: Objection. Form. 16:57:35

A The '345 patent describes an embodiment of the invention in which there is a single future minimum for a particular frequency bin being derived 16:57:39 16:57:43 16:57:49

in accordance with its corresponding future minimum value. 16:57:52 16:57:55

Q Claim 1 of the '345 patent specifies detecting the position of noise elements for each frequency bin. 16:58:26 16:58:29 16:58:32

Is that element satisfied by detecting the position of speech elements for each frequency bin? 16:58:33 16:58:36

MR. LENNIE: Objection. Form. 16:58:45

A Detecting speech and detecting noise are different. A system that detects speech is not one that then necessarily is detecting noise and vice versa. 16:58:52 16:58:55 16:59:00 16:59:05

Q Detecting the position of speech elements is different than detecting the position of noise elements in your view? 16:59:06 16:59:08 16:59:10

A Generally, yes. It would depend on the resulting system in terms of providing some additional context in order to evaluate the statement. 16:59:13 16:59:15 16:59:22

Q The Hirsch article describes detecting the onset of speech? 16:59:45 16:59:49

A Yes. 16:59:53

Q When Hirsch detects the onset of speech, is 16:59:56

that the same as detecting the position of noise? 16:59:59

A No, it's not. 17:00:04

Q Prior to when Hirsch detects the onset -- 17:00:11

strike that. 17:00:13

Does claim 1 of the '345 patent require 17:00:43

subtracting noise from each frequency bin? 17:00:47

MR. LENNIE: Objection. Form. 17:00:54

A Claim 1 requires an apparatus for canceling 17:01:01

noise, and the elements for the noise cancellation are 17:01:04

here indicated, as we've discussed. 17:01:09

Q So claim 1 specifies an input for inputting 17:01:14

an audio signal, correct? 17:01:19

A It does. 17:01:22

Q And it specifies a frequency spectrum 17:01:22

generator for turning the audio signal into a 17:01:26

frequency spectrum, correct? 17:01:30

A For generating the frequency spectrum of 17:01:31

said audio signal. 17:01:36

Q Then it specifies a threshold detector, 17:01:37

correct? 17:01:40

A "A threshold detector for setting a 17:01:40

threshold for each frequency bin using a noise 17:01:44

estimation process" and then continuing with respect to the language of the claim. 17:01:47 17:01:48

Q So claim 1 requires detecting the position of noise but it does not require removing the noise? 17:01:51 17:01:54

A It requires an apparatus for canceling noise. 17:02:02 17:02:05

Q It is not necessary to remove noise from the signal to practice claim 1 of the '345 patent? 17:02:06 17:02:13

MR. LENNIE: Objection. Form. 17:02:20

A I'm trying to understand what you mean by "remove." Is there a context that you can give the term in? Because it's an apparatus for canceling noise. 17:02:21 17:02:25 17:02:28 17:02:31

Q Does claim 1 of the '345 patent require canceling noise? 17:02:41 17:02:43

A It requires an apparatus for canceling noise. 17:02:47 17:02:52

Q Do one of the three elements of claim 1 specify the step of canceling noise? 17:02:53 17:02:56

A Those three steps do not indicate how the noise is canceled in the apparatus for canceling noise. 17:03:08 17:03:15 17:03:20

Q Practicing those three steps would not result in canceling noise? 17:03:20 17:03:23

MR. LENNIE: Objection. Form. 17:03:27

A Those three steps could be used in an apparatus for canceling noise, which is what the claim is about. 17:03:29 17:03:32 17:03:35

Q Claim 13 specifies the apparatus of claim 1, further comprising a subtractor for subtracting the noise elements, and it goes on. 17:03:36 17:03:38 17:03:42

A Yes. 17:03:44

Q Is that correct? 17:03:45

A I see that. 17:03:45

Q Claim 13 would result in canceling noise, correct? 17:03:48 17:03:57

A It is a system that would have a subtractor for subtracting said noise elements estimated at said positions determined by said threshold detector. 17:03:58 17:04:02 17:04:05

Q Would it cancel noise? 17:04:09

MR. LENNIE: Objection. Form. 17:04:10

A Again, an apparatus for canceling noise employing both the -- the limitations in claim 1 and in claim 12 would operate on a signal to -- again, 17:04:22 17:04:30 17:04:35

cancel noise -- one would have to look at the resulting system to decide. Again, it's a hypothetical, I don't -- I don't have a system in front of me to make a -- 17:04:41 17:04:45 17:04:52 17:04:53

Q Did you mean claim 13? 17:04:56

A I'm sorry, it's claim 13. I meant claim 13, thank you. 17:04:57 17:05:00

Q Looking at the steps of claim 1 and claim 13, you cannot tell if practicing those steps would result in canceling noise? 17:05:02 17:05:05 17:05:09

A Again, using both 1 and 13 in the design of the system, it could result in a system that would cancel noise, yes. It would depend upon the implementation of the overall system. 17:05:22 17:05:26 17:05:28 17:05:33

Q A system that includes the limitations of claims 1 and 13 does not necessarily cancel noise? 17:05:37 17:05:40

MR. LENNIE: Objection. Form. 17:05:46

A Yeah. I mean, a system which practices both of these limitations is one that's oriented towards canceling noise. But again, having the system in front of me and with sufficient time, one could judge basically the functionality of it. 17:05:50 17:05:55 17:05:58 17:06:03 17:06:08

This is somewhat of a hypothetical situation is the reason why I'm -- I'm saying this. 17:06:11 17:06:13

Q So if a reference disclosed the three elements of claim 1 and the subtractor of claim 13, that reference would not necessarily disclose canceling noise? 17:06:20 17:06:25 17:06:29 17:06:32

MR. LENNIE: Objection. Form. 17:06:35

A Again, a system that would have these elements could be an apparatus for canceling noise and would have the subtractor. It depends on the nature of the overall system. 17:07:14 17:07:16 17:07:19 17:07:25

Again, it's a hypothetical. I'm trying -- I'm trying to figure out, you know, the nature of the question, that's why. 17:07:26 17:07:28 17:07:30

Q If Respondents showed that a reference disclosed the three elements of claim 1, would they have shown that that same reference discloses an apparatus for canceling noise? 17:07:32 17:07:35 17:07:39 17:07:45

MR. LENNIE: Objection. Form. 17:07:48

A Again, it -- it depends on the overall system. I -- I can't provide an opinion about this. I would need to be able to see the resulting system. 17:07:53 17:07:56 17:08:00

But claim 1 describes an apparatus for canceling noise that includes these particular elements. 17:08:03 17:08:08

Q Does claim 1 require an apparatus for canceling noise? 17:08:12 17:08:14

MR. LENNIE: Objection. Form. 17:08:16

A Claim 1 discloses an apparatus for canceling noise with these specific elements as part of that apparatus. 17:08:55 17:08:59 17:09:02

Q Do you know what the preamble of claim 1 is? 17:09:05

A Yes, it's the apparatus for canceling noise. 17:09:08

Q Is the preamble of claim 1 limiting? 17:09:11

MR. LENNIE: Objection. Form. 17:09:13

A I'm not a lawyer, so I'm not exactly sure how to apply the term. I don't want to necessarily misspeak with respect to that. 17:09:17 17:09:21 17:09:26

Q You don't know whether practicing claim 1 requires an apparatus for canceling noise? 17:09:32 17:09:37

MR. LENNIE: Objection. Form. 17:09:39

A Claim 1 discloses an apparatus for canceling noise with these particular elements in it. 17:09:50 17:09:53

Q Could I have an apparatus that detects noise without canceling noise? 17:09:56 17:09:59

MR. LENNIE: Objection. Form. 17:10:01

A Yeah. I mean, hypothetically you could have such a system. 17:10:02 17:10:05

Q Would claim 1 cover such a system? 17:10:07

MR. LENNIE: Objection. Form. 17:10:10

A I'm -- again, just a moment. 17:10:12

(Reviewing.) 17:10:27

Claim 1 discloses an apparatus for canceling noise, and it comprises these three elements, as we've described. The system, if designed for canceling noise and has these three inputs, then that system would be covered under claim 1. 17:12:05 17:12:08 17:12:12 17:12:17 17:12:21

Q When were you first hired by Andrea? 17:12:34

A For this matter? 17:12:38

Q No, first. Like, for example -- 17:12:40

A Yeah, I mean -- 17:12:44

Q -- you were retained by Andrea in the previous '949 investigation? 17:12:45 17:12:47

A Yes. I'm -- I'm trying to remember. I believe it was maybe about two years ago, I want to say, something like this. 17:12:49 17:12:51 17:12:59

Q For the '949 investigation? 17:13:01

A For the '949 investigation, yes. 17:13:02

Q Prior to being retained by Andrea, had you heard of the Hirsch article? 17:13:05 17:13:07

A I was not aware of the Hirsch article prior to my engagement with Andrea. 17:13:15 17:13:17

Q Before you were retained by Andrea, were you familiar with the Martin 1993 article? 17:13:23 17:13:29

A I -- I don't believe so, but I'm -- again, I mean, we're going pretty far back in time. 17:13:34 17:13:39

Q Prior to being retained by Andrea, had you heard of Rainer Martin? 17:13:44 17:13:46

A Oh, yes, yes. I know Rainer Martin. 17:13:49

Q Why do you know Rainer Martin? 17:13:52

A He attends signal processing conferences as I do. 17:13:54 17:13:57

Q When did you first meet Rainer Martin? 17:13:58

A It's -- again, I can't pull from memory exactly when we first met. I'm sure -- I'm -- I'm confident it was likely at an ICASSP conference. Which is I-C-A-S-S-P. 17:14:05 17:14:09 17:14:12 17:14:14

Q Ten years ago, five years ago, 20 years ago? Just ballpark, not -- 17:14:18 17:14:21

A Ballpark, it's -- it's probably closer to 20. What's interesting is when I came across the article, I could picture his face. So I know I met him. But, you know, I don't know if it was in an elevator or exactly where. 17:14:22 17:14:24 17:14:28 17:14:31 17:14:35

Q Is Rainer Martin well known in his field? 17:14:43

A That's a hard judgment call for me to make. There are many famous people in signal processing. I certainly wouldn't want to be on the record to call out one and not leave out others. 17:14:55 17:15:02 17:15:06 17:15:10

Q Were you familiar with Dr. Martin's work prior to being retained by Andrea in this case? 17:15:15 17:15:19

A I recall that he did audio processing, but I can't say -- and again, this is based off of memory -- whether yes, I had this -- I had this work in mind. But again, this is -- this is going back some time. 17:15:30 17:15:34 17:15:37 17:15:44

Q Was your deposition taken in the '949 investigation? 17:16:13 17:16:15

A Was it taken, did you say? 17:16:19

Q Yes. 17:16:21

A Yes, it was. There was a deposition taken. 17:16:21

Q Do you happen to have the transcript? 17:16:35

A I don't. In fact, I have been asked this question before, and I don't recall getting it. So I can't say that I have even seen it. 17:16:36 17:16:42 17:16:47

Q Have you done expert reports on invalidity or validity for anyone else aside from Andrea? 17:16:52 17:16:57

A Yes, I have. 17:17:02

Q Was it directed to patent validity or patent invalidity? 17:17:04 17:17:07

A It was directed towards patent invalidity. I've also done work related to interference. But I -- I don't want to say too much about those cases because they're -- they fall under Protective Order, so I don't want to be describing features of those cases if I can help it. 17:17:11 17:17:14 17:17:20 17:17:23 17:17:25 17:17:28

Q Approximately how long ago did you prepare a report on patent invalidity? 17:17:30 17:17:32

A What do you mean? 17:17:37

Q Well, when did you prepare that expert report, five years ago, two years ago? 17:17:38 17:17:40

A What -- what report are you talking about? I mean, I guess I'm -- 17:17:42 17:17:47

Q Sorry. Earlier you said you had done an 17:17:49

expert report on invalidity for -- 17:17:51

A Yeah. 17:17:54

Q -- someone else? 17:17:54

A I'm -- I'm trying to remember. Well -- and 17:17:55

you're referring to the term "expert report." I've -- 17:18:15

I've done -- I've certainly done reports -- I mean 17:18:17

legal reports. I don't know if it was an expert 17:18:22

report. 17:18:25

Again, I'm -- I -- the legal term of what an 17:18:26

expert report is, I don't want to be in a position to 17:18:29

try to claim or declare. 17:18:32

Q You offered opinions about whether a patent 17:18:34

was invalid previously? 17:18:36

A Yes. 17:18:40

Q Approximately when did you offer those 17:18:41

opinions? 17:18:42

A (Reviewing.) 17:18:50

It would have been around the time 17:19:07

between -- sometime between August and December of 17:19:08

2015. 17:19:12

Q So some time ago? 17:19:20

A Uh-huh. 17:19:21

Q Do you know what a beamformer is? 17:19:36
A Are you speaking generally or -- 17:19:41
Q In general. 17:19:42
A Yes, I do. 17:19:44
Q In the context of like audio signal 17:19:49
processing for microphones, do you know what a 17:19:54
beamformer is? 17:19:56
A Yes, I mean, again in general, in terms 17:19:57
of ... 17:19:59
Q Would a beamformer require more than one 17:19:59
microphone? 17:20:02
MR. LENNIE: Objection. Form. 17:20:12
A Again, we're speaking hypothetically. It is 17:20:13
possible to have a system -- I mean, you say more than 17:20:16
one microphone. It gets into the structure of the 17:20:22
resulting acoustic device and that in addition to the 17:20:26
resulting processing that you might have. 17:20:31
Q Uh-huh. 17:20:34
A I mean, there could be multiple signals that 17:20:35
come off of the one device, there could be multiple 17:20:38
devices that produce multiple signals, there could be 17:20:42
systems that have multiple elements that combine 17:20:46

values to produce one signal. I mean, there's many different ways to -- to calculate a beam. 17:20:49 17:20:52

Q Could a beamformer be an array of microphones? 17:20:57 17:21:01

A Yes, it can. Or, sorry, it can -- one of the elements of a beamformer could be an array of microphones. 17:21:01 17:21:06 17:21:11

Q And an array of microphones is not necessarily adaptive, correct? 17:21:14 17:21:16

MR. LENNIE: Objection. Form. 17:21:24

A Again, I'd have to look at the system to decide whether a particular system with multiple microphones is adaptive. 17:21:28 17:21:31 17:21:34

Q Earlier you mentioned an adaptive array included coefficients. Does that sound familiar to you? 17:22:01 17:22:04 17:22:07

A An adaptive array can include coefficients, yes. 17:22:08 17:22:12

Q What would the coefficients of an adaptive array be used for? 17:22:13 17:22:15

A A system having multiple sensors and adaptive coefficients -- 17:22:21 17:22:24

Q What --
A -- would have -- I'm sorry, I'm continuing -- would have some method of tuning the coefficients in order to attain some useful outcome with respect to the overall processing of the system.
Q What is an example of a useful outcome with respect to the overall processing of the system?
A For example, one could use such a system to steer a null in a particular direction to reduce the gain associated with a particular interferer.
Q The coefficients are used to steer the adaptive array?
A They are used to adjust the gain; i.e., what's so-called steer, and to create gain as a function of a particular direction to allow the system to, for example, emphasize certain directions or, as another example, deemphasize certain directions in terms of the overall gain.
Q Is that what it means for the array to be adaptive?
A That's an example of a system that is an adaptive array.

MR. BROUGHAN: Why don't we take a break real quick. We might be close. 17:24:29 17:24:30

THE WITNESS: Okay. 17:24:30

THE VIDEOGRAPHER: Going off the record. The time is 5:24. 17:24:32 17:24:32

(A recess was taken.) 17:36:39

THE VIDEOGRAPHER: Back on the record. The time is 5:37. 17:36:56 17:36:56

BY MR. BROUGHAN: 17:37:00

Q Prior to analyzing whether the prior art anticipated any of the claims, did you determine the scope of the claim? 17:37:04 17:37:07 17:37:11

Strike that. 17:37:16

Prior to analyzing whether any of the prior art references anticipated claim 1 of the '345 patent, did you determine the scope of the '345 patent, claim 1? 17:37:18 17:37:20 17:37:24 17:37:28

A I read the '345 patent, particularly the specification, to understand what the invention was about. 17:37:44 17:37:48 17:37:51

Q Did you analyze each of the claims of the '345 patent? 17:37:54 17:37:57

A I -- I have a question. I'm not sure if you're talking about when I first examined the '345 patent and is it with respect to this matter or previous matters? 17:38:44 17:38:46 17:38:50 17:38:53

Q Prior to analyzing Dr. Kyriakakis's report and the prior art references he identified, did you determine the scope of claim 1 of the '345 patent? 17:38:55 17:38:58 17:39:01

A The specification for the '345 patent informed me as to the elements of the individual claims with respect to the patent. 17:40:22 17:40:24 17:40:31

I didn't try to figure out all possible systems that would be the systems that would correspond to these -- to these particular claims. 17:40:42 17:40:45 17:40:52

Q So first you looked at the prior art that Dr. Kyriakakis identified, then you determined the scope of claim 1 of the '345 patent? 17:40:55 17:40:58 17:41:01

MR. LENNIE: Objection. Form. 17:41:04

A I looked at the patent to inform myself of the technology that's contained within the patent to understand the claims and their -- I mean, basically the technology that those claims cover. That informed me in my analysis of Dr. Kyriakakis's positions with 17:41:09 17:41:12 17:41:15 17:41:22 17:41:25

regard to those claims. 17:41:31

Q The art provided by Dr. Kyriakakis helped you understand the scope of claim 1 of the '345 patent? 17:41:53 17:41:57 17:42:03

A No. The description that the inventors described in their specification informed me of how the system functions and, in particular, the various different features and how they are implemented. 17:42:16 17:42:23 17:42:27 17:42:30

Q Did you analyze the scope of claim 1 in the context of the '345 specification prior to reading Dr. Kyriakakis's report? 17:42:37 17:42:40 17:42:46

A I read the patent; in particular, the specification of the patent and the description of the technology within it to understand the meaning of the elements within the claims and this enabled me to understand and to respond to, along with my own experience and my own knowledge, the assertions made by Dr. Kyriakakis in his report. 17:43:02 17:43:06 17:43:08 17:43:14 17:43:18 17:43:23 17:43:28

Q The '345 specification describes a threshold detector that uses a single threshold; is that accurate? 17:43:47 17:43:52 17:43:55

A The '345 specification includes an 17:44:04

embodiment which uses a threshold detector for setting a threshold for each frequency bin using a noise estimation process. 17:44:06 17:44:11 17:44:15

Q Ant it sets a single threshold for each frequency bin using a noise estimation process, correct? 17:44:16 17:44:19 17:44:19

A It uses a threshold detector for setting a threshold for each frequency bin. There is a threshold for each frequency bin. 17:44:26 17:44:31 17:44:34

Q There is -- 17:44:36

A Threshold detector. 17:44:37

Q The '345 specification describes a threshold detector that uses just one threshold for each frequency bin? 17:44:38 17:44:42 17:44:46

A It uses a threshold detector and it sets a single threshold for each frequency bin. 17:45:00 17:45:04

Q Claim 1 describes a system that includes a threshold detector for setting a threshold for each frequency bin using a noise estimation process, correct? 17:45:21 17:45:25 17:45:29 17:45:33

A Yes. 17:45:34

Q The threshold detector of claim 1 requires 17:45:41

setting a single frequency -- strike that. 17:45:43

The threshold detector of claim 1 requires 17:45:48

setting a single threshold for each frequency bin? 17:45:51

MR. LENNIE: Objection. Form. 17:45:55

A It doesn't require setting a single 17:45:57

threshold. The '345 specification provides an example 17:46:00

embodiment which uses a single threshold. But there 17:46:04

is no limitation of that sort shown in claim 1. 17:46:08

Q The '345 specification described a process 17:46:35

for setting the threshold that uses a current minimum 17:46:39

value and a future minimum value for each frequency 17:46:45

bin, correct? 17:46:48

A It does, yes. 17:46:50

Q The process described in the specification 17:46:52

of the '345 patent uses a single future minimum and 17:46:54

single current minimum for each future -- each 17:46:57

frequency bin, correct? 17:47:02

A It has a current minimum and a corresponding 17:47:06

future minimum -- a current minimum value and 17:47:19

corresponding future minimum value as part of the 17:47:22

description of the specification, yes, in the 17:47:26

embodiment. 17:47:28

Q Is claim 4 limited to that embodiment? 17:47:36
A Claim 4 is not limited to that particular 17:47:40
embodiment. 17:47:42
Q How did you apply the preamble of claim 1 in 17:48:06
the analysis in your report? 17:48:09
A What do you mean by "apply the preamble of 17:48:19
claim 1"? 17:48:21
Q In your report did you treat the preamble of 17:48:22
claim 1 as limiting? 17:48:26
A I considered systems that are examples of an 17:48:44
apparatus for canceling noise. 17:48:50
Q Did you consider challenging whether any 17:49:12
reference anticipated claim 1 because it did not 17:49:14
disclose an apparatus for canceling noise? 17:49:17
A Again, just to be sure of clarity, can you 17:49:44
repeat the question? 17:49:47
Q Did you consider challenging whether any 17:49:50
reference anticipated claim 1 because it did not 17:49:52
disclose an apparatus for canceling noise? 17:49:55
A There were references that I considered 17:50:47
whose focus was on particular aspects of elements of 17:50:50
the '345 patent and in terms of an alleged relation 17:50:55

according to Dr. Kyriakakis's report. 17:51:03

I looked at those systems in combination 17:51:08

with other ones that were an apparatus for canceling 17:51:10

noise to consider how those systems might read on the 17:51:16

individual claims. 17:51:21

Q Claim 17 of the '345 patent is directed 17:51:27

towards the apparatus of claim 1 and 13 that also 17:51:30

includes a residual noise processor? 17:51:35

A I see that, yes. 17:51:41

Q If you look at claim 19, it specifies that 17:51:44

the residual noise processor includes a voice switch 17:51:51

for detecting non-speech segments? 17:51:55

A I see that, yes. 17:51:58

Q What is a voice switch for detecting 17:51:59

non-speech segments? 17:52:03

A Well, generally it's a system that is 17:52:05

designed to determine whether there is speech or noise 17:52:08

present within a particular segment of time. 17:52:12

Q For example, it would determine whether a 17:52:22

frame is a speech frame or a noise frame? 17:52:24

A It's actually looking for segments which are 17:52:39

non-speech segments. 17:52:48

Q So it determines whether a frame or series of frames corresponds to noise only? 17:53:04 17:53:06

A Well, again, speaking generally and hypothetically, without having the system in front of me to analyze, it's a system for detecting non-speech segments, which means segments which don't contain speech. 17:53:21 17:53:23 17:53:25 17:53:34 17:53:38

Q Why do you need a system in front of you to determine the scope of one of the claims of the patent? 17:53:47 17:53:49 17:53:52

A I'm -- 17:53:56

MR. LENNIE: Objection. Form. 17:53:59

A So I've been asked to provide opinions as a rebuttal to Dr. Kyriakakis's report. So I have performed an analysis of the assertions made by the other expert. I have been using those -- the references mentioned by that other expert, or indicated by the other expert, as part of my analysis. 17:54:09 17:54:12 17:54:17 17:54:23 17:54:28 17:54:31

Q You cannot determine the scope of this claim without seeing a system to apply it to? 17:54:35 17:54:39

A In the process of doing this analysis, I used the specification of the '345 patent as well as 17:55:12 17:55:15

my own experience to determine the understanding of what these individual elements are and in the process of providing my opinions, I've looked at the references that have been provided by the other expert in order to perform my analysis. 17:55:19 17:55:23 17:55:27 17:55:30 17:55:34

Q Were you able to come to an understanding of what each claim of the '345 patent meant before applying it to a system identified by Dr. Kyriakakis? 17:55:44 17:55:46 17:55:50

A I have an understanding of what these individual elements and claims mean that has informed to me from the specification as well as my own experience and my knowledge and expertise in the area that allows me to perform an analysis of the assertions made by Dr. Kyriakakis in his report. 17:56:04 17:56:06 17:56:10 17:56:13 17:56:16 17:56:20

Q And what is that understanding for a threshold detector for setting a threshold for each frequency bin using a noise estimation process for claim 1? 17:56:34 17:56:42 17:56:45 17:56:48

A It is an understanding as informed by the embodiment, as an example, where the embodiment tells me how one can implement a threshold detector for setting a threshold for each frequency bin using a 17:56:54 17:56:56 17:57:01 17:57:06

noise estimation process as an example. 17:57:09

MR. BROUGHAN: Apple doesn't have anything further. 17:57:29 17:57:30

MR. SWANSON: No further questions. 17:57:32

MR. WINSTON: I don't have any questions. 17:57:34

MR. LENNIE: I don't have any questions either. 17:57:35 17:57:37

THE VIDEOGRAPHER: This marks end of the deposition. We're going off the record at 5:57. 17:57:39 17:57:41

(Off the record at 5:57 p.m.) 17:57:42

ACKNOWLEDGMENT OF DEPONENT

I, Scott Clinton Douglas, Ph.D., do hereby acknowledge that I have read and examined the foregoing testimony, and the same is a true, correct and complete transcription of the testimony given by me, and any corrections appear on the attached Errata sheet signed by me.

_____ _____

(DATE) (SIGNATURE)

CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC

I, Dawn M. Hart, the officer before whom the foregoing deposition was taken, do hereby certify that the foregoing transcript is a true and correct record of the testimony given; that said testimony was taken by me stenographically and thereafter reduced to typewriting under my direction; that reading and signing was requested; and that I am neither counsel for, related to, nor employed by any of the parties to this case and have no interest, financial or otherwise, in its outcome.

IN WITNESS WHEREOF, I have set my hand and affixed my notarial seal this 20th day of June 2017.

My Commission Expires:

July 14, 2020

_____

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