

1 UNITED STATES PATENT AND TRADEMARK OFFICE

2
3 BEFORE THE PATENT TRIAL AND APPEAL BOARD
4

5
6 INDUCTEV, INC.,

7 Petitioner,

8 v.

9 WITRICITY CORPORATION,

10 Patent Owner.

11
12 Case IPR2023-01182

13 Patent 8,461,719
14

15 DEPOSITION OF

16 MARK N. HORENSTEIN, Ph.D.

17 THURSDAY, AUGUST 8, 2024

18 Remote Video Teleconference

19 5:59 a.m. PDT

20 to

21 9:56 a.m. PDT
22

23 Stenographically Reported by:

24 Burgundy B. Ryan, RPR,

25 CSR No. 11373

Job No. 545569

Pages 1-101

A P P E A R A N C E S

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DEPOSITION SUPPORT INDEX

QUESTIONS INSTRUCTED NOT TO ANSWER:

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(None)

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STIPULATIONS

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QUESTIONS MARKED

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(None)

REPORTER'S NOTE:

QUOTATION MARKS ARE USED FOR CLARITY AND DO NOT
NECESSARILY REFLECT A DIRECT QUOTE.

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E X H I B I T S

EXHIBIT	DESCRIPTION	PAGE
1001	U.S. Patent No. 8,461,719	18
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1 BE IT REMEMBERED that, pursuant to Notice
2 of Taking Deposition, and on Thursday, August 8,
3 2024, commencing at 5:59 a.m. PDT thereof, via
4 remote video teleconference, before me, Burgundy B.
5 Ryan, a Certified Shorthand Reporter in and for the
6 State of California, personally appeared

7 MARK N. HORENSTEIN, Ph.D.,
8 a witness called on behalf of PETITIONER, who,
9 having been first duly sworn by me to testify to the
10 truth, was examined and testified as follows:

11 IT TECHNICIAN: Thank you to everyone for
12 attending this proceeding remotely, which we
13 anticipate will run smoothly.

14 Please remember to speak slowly, and do
15 your best not to talk over one another.

16 Please be aware that we are recording this
17 proceeding for backup purposes. Any off-the-record
18 discussions should be had away from the computer.
19 And please remember to mute your microphone for
20 those conversations.

21 Please have your video enabled to help the
22 reporter identify who is speaking. If you are
23 unable to connect with video and are connecting via
24 phone, please identify yourself each time before
25 speaking.

1 We will provide a complimentary unedited
2 recording of this deposition with the purchase of a
3 transcript.

4 I do apologize in advance for any
5 technical-related interruptions. Thank you.

6 And our court reporter may proceed.

7 COURT REPORTER: Counsel, please identify
8 yourselves for the record, starting with the taking
9 attorney.

10 MR. PETERS: Steven Peters with Latham &
11 Watkins on behalf of Petitioner InductEV.

12 MR. LAWSON: And this is Lance Lawson with
13 Burr & Forman law firm and on behalf of WiTricity
14 Corporation and also defending Dr. Horenstein today.

15 MR. PETERS: Also with me is Blake Davis,
16 also with Petitioner.

17 (Whereupon, the witness was sworn.)

18 COURT REPORTER: Thank you very much.

19 Counsel, you may proceed.

20 MARK N. HORENSTEIN, Ph.D.,
21 having been first duly sworn to tell the whole
22 truth, testified as follows:

23 EXAMINATION

24 By MR. PETERS:

25 Q. Please state your name for the record.

1 Can you hear me?

2 A. Did you say state my name?

3 Q. Yes, please.

4 A. Yes. Mark Horenstein.

5 Q. Okay. I just wanted to make sure I
6 pronounce it correctly.

7 Good morning, Dr. Horenstein.

8 A. Good morning.

9 Q. Where are you this morning?

10 A. We're in a conference room of the WiTricity
11 facility.

12 Q. What city is that?

13 A. Watertown, Massachusetts.

14 Q. Anybody else in the room with you?

15 A. Just Mr. Lawson.

16 Q. Are you communicating with anybody outside
17 of this Zoom deposition right now?

18 A. No.

19 Q. What's your understanding as to why you're
20 being deposed today?

21 A. You are deposing me over two declarations I
22 wrote on behalf of the patent holders -- patent
23 holder WiTricity.

24 Q. And just so we're clear, this current
25 deposition is just for your declaration in relation

1 to the '719 patent. Do you understand that?

2 A. I was told it also covered the '687 patent,
3 but I'm happy to stick with just the '719.

4 Q. Well, we'll be getting into that later
5 today, but for now, we're going to stick with the
6 '719.

7 A. Oh, I see.

8 MR. LAWSON: Just -- just for the record,
9 as I understand it, Counsel, there's going to be two
10 separate depositions today. The first one that
11 you're taking is regarding the '719; right?

12 MR. PETERS: That's right.

13 MR. LAWSON: Okay.

14 THE WITNESS: Sorry. That had been
15 explained to me. I just forgot.

16 By MR. PETERS:

17 Q. No problem at all.

18 Did you -- let's see. Do you have any
19 materials with you today?

20 A. None that are in front of me.

21 Q. So if I pass the -- your declaration and
22 the '719 patent to you over chat, will you open that
23 up. I'll be introducing it as Exhibit --

24 A. Sorry. You're --

25 Q. Can you hear me?

1 A. Yes.

2 Q. Okay. I'm going to introduce Exhibit 2011
3 into the chat. It's the declaration of Mike
4 Horenstein. If you could go ahead and open that up
5 for me when you have a chance and let me know when
6 you're ready.

7 (Whereupon, Horenstein Exhibit 2011 was marked for
8 identification.)

9 THE WITNESS: It's open.

10 By MR. PETERS:

11 Q. Did you write this declaration?

12 A. I have not yet received the declaration.

13 Q. Okay. So when you said it was open, what
14 were you referring to?

15 MR. LAWSON: Counsel, just -- just for said
16 note for the record, I'm not seeing the
17 declaration.

18 MR. PETERS: Well, I might have passed it
19 to the -- in the prior chat to the court reporter.
20 I apologize.

21 MR. LAWSON: Yeah. Just for the record,
22 Counsel --

23 (Court Reporter clarification.)

24 MR. PETERS: He is coming through Dr.
25 Horenstein's audio.

1 I can't -- I can't either.

2 IT TECHNICIAN: Can we go off the record to
3 address any technical issues, sir?

4 MR. PETERS: Yes.

5 COURT REPORTER: We're off the record.

6 (Recess.)

7 COURT REPORTER: We're back on the record.
8 Please proceed.

9 By MR. PETERS:

10 Q. All right. Dr. Horenstein, do you see
11 Exhibit 2011 in the chat now?

12 A. I do.

13 Q. Okay. Great. Could you open that up and
14 let me know when you're ready?

15 A. Okay. It is open.

16 Q. Did you draft Exhibit -- sorry -- I'll
17 withdraw that.

18 Did you write your declaration in this
19 case?

20 A. Yes.

21 Q. How much time did you spend writing your
22 declaration?

23 A. I'm not sure.

24 Q. More than five hours?

25 A. Yes.

1 Q. More than 100 hours?

2 A. No.

3 Q. How much time have you spent on this IPR in
4 total?

5 A. Just the '719?

6 Q. Just the '719.

7 A. Rough estimate, 40 hours, give or take.

8 Q. Does that include the preparation for
9 today's deposition?

10 A. No, not really.

11 Q. Did you do anything to prepare for this
12 deposition?

13 A. Yes.

14 Q. What did you do to prepare for today's
15 deposition?

16 MR. LAWSON: I'd just caution the witness
17 that you can answer the question but would caution
18 you not to disclose any conversations that you had
19 with counsel. Otherwise, you can tell them that you
20 met and -- and how long you met and things like
21 that. Okay?

22 THE WITNESS: So I reread relevant
23 documents, and I met yesterday with Mr. Lawson.

24 By MR. PETERS:

25 Q. Did you meet with anybody besides Mr.

1 Lawson in preparing for today's deposition?

2 A. No.

3 Q. What documents did you read in preparing
4 for today's deposition?

5 A. The '719 patent and the prior art that is
6 discussed in the declaration.

7 Q. Now, you've been deposed before; is that
8 right, Dr. Horenstein?

9 A. Yes.

10 Q. I think it says in your CV that you have
11 been deposed more than 50 times; is that right?

12 A. That's -- that's a good estimate.

13 Q. All right. Can you turn to page 30 of your
14 declaration.

15 (Court Reporter clarification.)

16 MR. PETERS: 30.

17 THE WITNESS: Yes, sir.

18 By MR. PETERS:

19 Q. Now I am having problems, but I'll just
20 wait for my problem to clear up.

21 At the top of page 30, you have a figure
22 that shows three capacitors in parallel; is that
23 right?

24 A. Yes.

25 (Court Reporter clarification.)

1 By MR. PETERS:

2 Q. Three capacitors in parallel.

3 A. Yes.

4 Q. I'll try to speak more slowly. I
5 apologize. It's getting a little technical.

6 Now, in this figure you say that those
7 three capacitors in parallel are equivalent to a
8 single capacitor; is that right?

9 A. That's correct.

10 Q. How are three capacitors in parallel
11 equivalent to a single capacitor?

12 A. I only heard bits and pieces of your
13 question. It's broke up.

14 MR. PETERS: Is my audio going bad now?

15 A. Oh, I -- I think you said how are the three
16 capacitors in parallel equivalent to one capacitor?

17 By MR. PETERS:

18 Q. That was my question. Thank you.

19 A. Okay. So the answer is, a capacitor is
20 defined by how much charge it holds per unit
21 voltage. And if you apply a voltage between A and B
22 on the left, each of the capacitors -- it's
23 mislabeled or C1 is missing. It should be C1
24 starting at the left, C2 and C3.

25 Assuming those capacitors have the same

1 value, for the sake of discussion, they all hold a
2 certain amount of charge. If you combine them into
3 C-A-B, which is equivalent to the sum of the three
4 capacitances, it will hold the same amount of
5 charge. And from the point of view of an observer
6 making measurements between A and B, the circuit on
7 the right and the circuit on the left would be
8 indistinguishable from each other.

9 Q. Well, is that true only for three
10 capacitors in parallel, or is there some limit on
11 how many capacitors in parallel are equivalent to a
12 single capacitor?

13 A. There is no limit.

14 Q. What makes these capacitors -- sorry. I'll
15 withdraw that.

16 What does it mean for capacitors to be in
17 parallel?

18 A. It means that they all share the same
19 voltage. One terminal from each capacitor is
20 connected together to make a common connection, and
21 the other terminal from each capacitor is connected
22 together to make a second connection. And those
23 connections are labeled A and B in these diagrams.
24 Connection points -- sorry -- A and B.

25 Q. Was this a concept that a person of

1 ordinary skill in the art would have understood in
2 2007?

3 A. This is a concept that a high school senior
4 or college freshman would have understood; so, yes,
5 a person of skill would definitely have understood
6 this concept.

7 Q. Let's go to page 8 of your declaration.
8 Let me know when you're ready.

9 A. Okay.

10 Q. The bottom of page 8, you have two figures,
11 one on the left, one on the right.

12 Do you see that?

13 A. Yes.

14 Q. On the figure on the left, you have a
15 capacitance and an inductance. The capacitance is
16 labeled "C" and inductance is labeled "L"; is that
17 right?

18 A. Yes.

19 Q. If you put another capacitor in parallel
20 with that capacitor C, it will -- will it be
21 equivalent to a single capacitor in this case as
22 well?

23 A. The two capacitors in parallel will
24 function as a single capacitor if they are connected
25 in parallel.

1 Q. But they will have a different --

2 (Zoom distortion)

3 Q. -- effective capacitance than C , I guess?

4 (Court Reporter clarification.)

5 By MR. PETERS:

6 Q. I said they will have a different effective
7 capacitance than C ; is that right?

8 A. That's right.

9 Q. So in paragraph 20, do you see you have an
10 equation for resonant frequency? Is that correct?

11 A. Yes.

12 Q. And that equation --

13 A. Yes.

14 Q. -- it involves the capacitance C ; right?

15 A. That's right.

16 Q. So if you -- if we had two capacitors in
17 parallel there, that C would be replaced by, I
18 guess, what you call C - A - B or the effective
19 capacitance of those two capacitors; is that
20 right?

21 A. Yes.

22 Q. So if you could turn to page -- sorry --
23 paragraph 41.

24 A. Sorry. What paragraph number?

25 Q. 41. Actually, that's going to be -- that

1 paragraph is split over two pages, so I'm going to
2 look at page 22.

3 A. Okay.

4 Q. The last sentence of paragraph 41, you say,
5 "Impedance matching to the resonator on the right of
6 each circuit diagram."

7 A. I'm sorry, sir. I'm sorry. I'm sorry.
8 Paragraph 41. I apologize. Go ahead.

9 Q. Sure. Are you there?

10 A. Continue.

11 Q. Okay.

12 A. Yes.

13 Q. Yes, sir. The last sentence of paragraph
14 41, you see where it starts with "impedance
15 matching"?

16 A. Yeah.

17 Q. Okay. I'm going to read that sentence to
18 set up the question.

19 You say, "Impedance matching to the
20 resonator on the right of each circuit diagram
21 requires that all reactive components seen at the
22 input port can be canceled out by the network of
23 capacitors."

24 Do you see that?

25 A. Yes.

1 Q. What is impedance matching?

2 A. Well, the general concept of impedance
3 matching presumes that the source driving the
4 circuit has an internal series impedance or
5 equivalent, and matching that impedance to the
6 impedance of the load means canceling out the
7 imaginary parts and duplicating the real parts of
8 those impedances.

9 Q. Is impedance matching something that a
10 person of ordinary skill in the art would have
11 understood in 2007?

12 A. Yes.

13 Q. I'm going to introduce Exhibit 1001 into
14 the chat. This is the '719 patent. If you can open
15 that up and let me know when you're ready.
16 (Whereupon, Horenstein Exhibit 1001 was marked for
17 identification.)

18 THE WITNESS: Okay.

19 By MR. PETERS:

20 Q. Did you read this whole patent in
21 preparation for your declaration?

22 A. Yes.

23 Q. Could you turn to paragraph 44 -- not
24 paragraph -- column 44 of the '719 patent?

25 A. Okay.

1 Q. I would like to focus your attention
2 starting at line 20 of column 44.

3 A. Okay.

4 At the end of the first sentence that
5 starts at line 20, the '719 patent refers to the
6 "specific impedance Z^* " and says that " Z_o " may be
7 complex and the $*$ denotes complex conjugation."

8 Do you see that?

9 A. Yes.

10 Q. Now, it was because of this Z_o can be --
11 could have a complex conjugation, Z_o can be complex.
12 Is that your understanding from this passage?

13 A. In general, Z_o can be complex.

14 Q. Well, I --

15 A. Yeah, I read this portion of the '719
16 patent.

17 Q. This paragraph?

18 A. Is your question did I read this paragraph?

19 Q. Yeah. Are you familiar with this
20 paragraph?

21 A. I read this paragraph.

22 Q. So what is Z -- Z_o in this paragraph?

23 A. Z_o would be the impedance -- the se- -- the
24 series impedance of whatever is driving the load.
25 So it would represent the impedance in series with a

1 voltage source that would otherwise be considered
2 ideal.

3 Q. Okay. At line -- starting at line 31 to
4 line 32, it says that --

5 A. Yes.

6 Q. -- "there is an external circuit that may
7 be a transmission line with characteristic impedance
8 Z_o ."

9 Is -- is that consistent with your
10 understanding of Z_o ?

11 A. Yes.

12 Q. All right. And it says that -- in the next
13 sentence, I believe, "The external circuit" --
14 actually, it's the same sentence. "The external
15 circuit may be a transmission line with
16 characteristic impedance, Z_o , and may exchange power
17 at maximum efficiency, namely with zero reflections,
18 when connected to an impedance Z^*_o ;" is that
19 right?

20 A. That's right.

21 Q. Is that saying that the impedance is
22 matched when the impedance of the external circuit
23 is Z^*_o ?

24 A. If the impedance of the driving circuit is
25 Z_o , then the impedance will be matched. There will

1 be a match when the impedance of the load is Z_o^* .

2 Q. Now, in general this is not disclosing that
3 you have to cancel out imaginary component or send
4 an imaginary component of impedance to zero. Is
5 that -- is that your understanding?

6 A. No. I disagree with what you just said.

7 Q. Okay. Why do you disagree?

8 A. Well, this paragraph says that the load
9 must be transformed into the complex conjugate of
10 the driving impedance, so what that means is if you
11 look at the imaginary parts of Z_o and Z_o^* , one will
12 be the negative of the other, and then when you add
13 those impedances together, those imaginary parts
14 cancel out.

15 Q. Right. But Z_o is the matched impedance;
16 right?

17 A. Well, Z_o is the impedance to be matched.

18 Q. Right. So the Z_o^* is what is being changed
19 in order to match Z_o ; is that right?

20 A. Well, assuming the load has some impedance
21 with a real or imaginary part, Z_o^* denotes the
22 transformed impedance; in other words, the load
23 impedance is transformed by --

24 (Zoom distortion)

25 (Court Reporter clarification.)

1 MR. PETERS: Yes. Let's go off the record.

2 (Recess.)

3 COURT REPORTER: We're back on the
4 record.

5 By MR. PETERS:

6 Q. Okay. Dr. Horenstein, your answer to my
7 previous question got cut off due to technical
8 issues. I will repeat the question. If you need
9 more context, I'm happy to provide that as well.

10 A. Okay.

11 Q. In the context of the '719 patent column
12 44, I asked is the Z_o^* what is being changed in
13 order to match Z_o ; is that right?

14 A. No.

15 Q. Why not?

16 A. What is being changed is the impedance seen
17 by the driver which has impedance Z_o . Z_o^* is what
18 the load impedance has been changed into.

19 Q. So impedance matching circuit would result
20 in Z_o^* -- matching Z_o or in Z_o matching Z_o^* ?

21 A. Well, a match means Z_o^* is equal to the
22 complex conjugate of Z_o , and the notation
23 specifically says it means Z_o^* is the complex
24 conjugate of Z_o .

25 Q. Can you turn to paragraph 45 of your

1 declaration?

2 A. Okay.

3 Q. Now, in the third sentence of paragraph 45,
4 you say, "Transforming a complex impedance Z equals
5 R plus JX into a completely real value at the
6 desired matching resistance requires at least two
7 degrees of freedom."

8 Do you see that?

9 A. Yes.

10 Q. Now, this -- sort of putting this in the
11 context of what we just saw from the '719 patent,
12 the '719 patent is not saying that you need to
13 transform the complex impedance into a completely
14 real value; right?

15 MR. LAWSON: Object to form.

16 THE WITNESS: The -- the excerpt we -- we
17 read from column 44 says you have to transform the
18 load impedance into the complex conjugate of the
19 driving impedance.

20 By MR. PETERS:

21 Q. And the complex conjugate of the driving
22 impedance is not necessarily a completely real
23 value; is that right?

24 A. I'm sorry. Could you repeat that again?

25 Q. Sure. You referred to the complex

1 conjugate of the driving impedance, and my question
2 is, the complex conjugate of the driving impedance
3 is not necessarily a completely real value;
4 correct?

5 MR. LAWSON: Object to form.

6 THE WITNESS: In the most general case, the
7 driving impedance can be complex.

8 By MR. PETERS:

9 Q. Can you go to paragraph 20 of your
10 declaration?

11 A. Okay.

12 Q. No. I'm sorry. Paragraph 21. I
13 apologize. We already talked about paragraph 20.

14 A. Okay.

15 Q. In paragraph 21 you refer to the Q factor,
16 or the quality of a resonator.

17 Do you see that?

18 A. Yes.

19 Q. You have an equation there that defines the
20 Q factor at the bottom of page 9.

21 Do you see that?

22 A. Yes.

23 Q. Would a person of ordinary skill in the art
24 have said that to be the definition of a Q factor of
25 a resonator?

1 A. Yes.

2 Q. And the L and the C correspond to the same
3 L and C that you have in the equation in paragraph
4 20; is that right?

5 A. That's right.

6 Q. Now, after that equation in paragraph 20,
7 you describe what L means and you describe what C
8 means and you also describe what RL means. Now, I
9 don't see RL in the equation above, and I'm
10 wondering if it's hidden within one of those terms
11 or there is no RL in the equation in paragraph 20?

12 A. RL does not affect the resonant frequency,
13 so it doesn't appear in the formula for omega one.

14 Q. Okay. Can you turn to paragraph 34 of your
15 declaration?

16 A. Okay.

17 Q. Now, in paragraph 34 you state that the
18 '719 patent also invokes the concept of the loss
19 tangent of insulating materials.

20 Do you see that?

21 A. I do.

22 Q. What is an insulating material?

23 A. It's a material that does not conduct
24 electricity.

25 Q. So metal is not an insulating material?

1 A. Generally not.

2 Q. Does that mean that metal does not have a
3 loss tangent?

4 A. Well, metal can have a loss tangent, but
5 the loss tangent is -- the conductivity of the metal
6 overshadows any loss tangent in terms of lossiness,
7 so it's generally not even considered a factor when
8 dealing with metals.

9 Q. Do you have any sense of what a typical
10 loss tangent would be for metal?

11 A. Off the top of my head, I don't.

12 Q. Would it be higher than the loss tangent
13 for an insulating material?

14 A. Yes.

15 Q. Significantly higher?

16 A. Well, the whole question is complicated
17 because the loss tangent is predicated on the wave
18 equation for the electric field being reduced to
19 something where the loss tangent can be pulled out
20 of the equation.

21 Once you get into a metal, the concept of
22 skin depth takes over and the wave equation breaks
23 down, so that's why it's very hard to ascertain the
24 loss tangent for a metal because it's generally
25 irrelevant. You can't propagate a wave through a

1 metal because the resistant -- the resistivity takes
2 over and just dissipates the -- the strength of
3 whatever wave is incident on the metal.

4 Q. But there is a -- I'm sorry. We will
5 withdraw that.

6 But metal does have a loss tangent. That's
7 what you testified to; right?

8 A. Well, I -- I think a person of skill would
9 not even consider the hypothetical number of loss
10 tangent in the metal because it's -- it's irrelevant
11 to the behavior of the metal. It's such a minor
12 factor that it doesn't affect the property of the
13 metal -- excuse me -- at all.

14 Q. So if somebody is referring to a loss
15 tangent, say, on paper, you sort of automatically
16 know they're talking about an insulating material?

17 A. Well, that depends on what the material
18 is.

19 Q. Right. But they're not going to be talking
20 about metal, if that's what you're -- that's what
21 you're saying.

22 MR. LAWSON: Object to the form.

23 THE WITNESS: It also depends on the
24 context, and without knowing the context of the
25 hypothetical paper you're talking about, it's hard

1 to answer your question.

2 By MR. PETERS:

3 Q. Okay. So you can't rule out that if
4 somebody mentions loss tangent, they might be
5 referring to metal?

6 A. What's the context?

7 Q. I'm just asking in general. Really I'm
8 trying to get a feel for if there is a such thing as
9 loss tangent in metal, and you initially said "yes."
10 You said it would be higher than insulating
11 material, and now, you know, there's -- it's more
12 complicated than that, and that's what I'm hearing
13 from you.

14 My question is, is it impossible for a
15 metal to have a loss tangent?

16 MR. LAWSON: Object to the form.

17 You can answer

18 THE WITNESS: You would -- could find a
19 loss tangent in the wave equation in -- in a metal,
20 but as I said before, I think I used the word
21 "dissipate." I was searching for the word
22 "attenuates."

23 The wave in a metal is attenuated so
24 rapidly that it cannot penetrate the metal beyond
25 something called the skin depth, and so any effect

1 that a loss tangent might have on the wave totally
2 washed out because the loss tangent was indicative
3 of the attenuation of the wave as it travels along
4 through the material.

5 In the metal, there is no traveling along
6 on the wave. It's attenuated, dissipated
7 immediately, so the concept of loss tangent, while a
8 theoretical number may exist, it's not really
9 relevant or practical to think about it.

10 By MR. PETERS:

11 Q. For metals; right?

12 A. Well, you have to define what you mean by a
13 metal, and I have assumed, in answering your
14 question, you're talking about common metals like
15 aluminum, copper, things that are generally thought
16 to be good conductors.

17 Q. Well, thank you for that clarification.

18 Now, would a person of ordinary skill in
19 the art have understood the concept of a loss
20 tangent in 2007?

21 A. A person of skill would have understood the
22 concept of loss tangent as it applies to insulators.

23 Q. Does the concept of loss tangent apply to
24 anything other than insulators? Actually let me
25 withdraw that.

1 Would a person of ordinary skill have
2 understood the concept of loss tangent as it applies
3 to something other than insulators?

4 A. It -- it depends on which concept you're
5 talking about. Once you start trying to solve the
6 wave equation in materials that have conductivity --
7 for example, metals or semiconductors -- then
8 equations become much more complicated, and that
9 person may or may not understand the concept.

10 Q. Let's go to paragraph 46 of your
11 declaration, and I'll start on page 25.

12 A. Okay.

13 Q. The first sentence of paragraph 46, you
14 describe, "The Smith chart is a tool used to
15 understand and visualize the degrees of freedom
16 provided by an impedance matching network."

17 Do you see that?

18 A. Yes.

19 Q. And I think you have an illustration of a
20 Smith chart on page 24.

21 Do you see that?

22 A. Yes.

23 Q. And -- and directly under that Smith chart,
24 you state in paragraph 44, "As a person of skill in
25 the art of electromagnetics would have known a Smith

1 chart can be used to properly sequence the tuning of
2 multiple variable capacitors," et cetera.

3 A. Yes.

4 Q. My question is, along those lines, would a
5 person of ordinary skill in the art in the field of
6 the '719 patent have understood the Smith charts?

7 A. Yes.

8 Q. Let's go back to the '719 patent quickly
9 and turn to column 64.

10 A. Okay.

11 Q. So the starting at line 20 in column 64 --

12 A. Okay.

13 Q. -- the sentence says, "So-called port
14 parameter measurement circuitry when measure -- when
15 monitor certain power, voltage, and current" and
16 then it goes on for a few more lines.

17 You're with me there; right?

18 A. Yes.

19 Q. What is power in a circuit?

20 A. Power is representative of energy per unit
21 time.

22 Q. And what is energy in a circuit?

23 A. Well, energy in general is measured in
24 joules, and it depends on the system to which you
25 apply the concept of energy.

1 In the case of the circuitry in the '719
2 patent, it means a quantity of either stored charge
3 or stored current.

4 Q. I guess what you're saying is power -- if
5 power is energy per unit time, then that stored
6 charge or stored current is changing; is that right?

7 A. It's -- it's moving is a better way to --
8 to -- better way to put it.

9 Q. And when stored charge moves, is that
10 called current?

11 A. That is called -- current is the movement
12 of charge.

13 Q. What's the movement of current? Is that
14 something?

15 A. No. Current is the motion of charge
16 particles. More generally the motion of charge, but
17 charge is manifest by charge particles.

18 Q. All right. Is power related to current in
19 a circuit?

20 A. Yes.

21 Q. Is it related to voltage in a circuit?

22 A. Yes.

23 Q. How is it related to current?

24 A. Well, it's related to current and voltage
25 at the same time. If a certain amount of current is

1 flowing, the power also -- depends on the amount of
2 current but also the voltage that is moving the
3 current. So in its simplest form, power is equal to
4 the voltage times the current.

5 In its basic -- the most simple definition
6 of power would be the product of voltage and
7 current.

8 Q. So if you measure the voltage and you
9 measure the current, then that would be one way of
10 measuring power?

11 A. If the voltage and current are in-phase.

12 Q. So what do you mean by "in-phase"?

13 A. Well, power -- voltage and current can
14 be -- can have -- can be direct current, meaning
15 that their magnitudes are constant. The current is
16 constant over time and the voltage is constant over
17 time. And in that case, power is the simple product
18 of the voltage and the current.

19 If you're talking about AC voltage and
20 currents, meaning they change with time, most
21 commonly sinusoidally with time, then "phase" refers
22 to the relative point along a given cycle that the
23 voltage reaches its peak compared to when the
24 current reaches its peak.

25 If the voltage and current are in-phase,

1 they reach their peak at the same time. And if they
2 are out-of-phase, then they meet their respective
3 peaks at different values of time.

4 Q. So I guess what you're saying -- part of
5 what you're saying there is that if you are
6 measuring DC voltage and DC current, then you could
7 know the power from those measurements?

8 A. That's right.

9 Q. But from AC voltage and AC current, you not
10 only need to know the, I guess, instantaneous value,
11 but you also need to know the phase difference
12 between them?

13 A. Well, the instantaneous value doesn't help
14 you to compute the power. You need to know the --
15 either the peak values of voltage and current or the
16 RMS values of voltage and current and know what
17 their -- the phase angle is between the voltage and
18 current signals.

19 Q. If -- if impedance were a real value, would
20 the current and voltage be in-phase?

21 A. That's correct.

22 I assume you mean the impedance being fed
23 by the voltage and current.

24 Q. Right. Thank you for that clarification.

25 A. Okay.

1 Q. It's been a long time since I took this
2 class. I think it might have been my worse class,
3 frankly.

4 But is this something a person of ordinary
5 skill in the art would have understood, as far as
6 the relationship between voltage current and power
7 in terms of an AC circuit and a DC circuit?

8 A. Yes.

9 Q. It's been over an hour since we started. I
10 know we took some breaks. Would you like a break
11 now, or do you want to keep going?

12 MR. LAWSON: Let's take a short break.

13 THE WITNESS: Sure. Let's take a break.

14 MR. PETERS: Sounds good.

15 COURT REPORTER: We're off the record.

16 (Recess.)

17 COURT REPORTER: We're back on the record.
18 You may proceed.

19 By MR. PETERS:

20 Q. Dr. Horenstein, did you speak with anybody
21 besides counsel during your break?

22 A. No.

23 Q. Did you speak to counsel about the
24 substance of your testimony today during the break?

25 A. No. No.

1 Q. I'm introducing Exhibit 1005 into the chat.
2 It is Cook-554. Please open it up and let me know
3 when you're ready.

4 (Whereupon, Horenstein Exhibit 1005 was marked for
5 identification.)

6 THE WITNESS: Okay.

7 By MR. PETERS:

8 Q. Would you take a look at Figure 1 of
9 Cook-554?

10	A. Okay.
----	----------

11 Q. Just for your reference, you reproduced
12 Figure 1 on page 39 of your declaration, if you want
13 to have that as a reference.

14 What does Component 140, which is the
15 tuning component, what does that do in Figure 1?

16 A. Well, the patent just says, "Tuning 140
17 along with orientation control 150 control
18 characteristics of the transmission."

19 Q. Do you have an understanding as to what
20 "tuning" means in this context?

21	A. Yes.
----	---------

22 Q. What's your understanding of what "tuning"
23 means in Figure 1?

A. It would mean adjusting the resonant frequency seen by the RF power source.

1 Q. Do you see Component 120, which is labeled
2 "matching"?

3 A. Yes.

4 Q. What's your understanding of "matching" in
5 the context of Figure 1?

6 A. Well, "matching" would mean causing the RF
7 power source to see the conjugate of its series
8 output impedance.

9 Q. We previously looked at equations for
10 resonant frequency -- well, an equation for resonant
11 frequency at paragraph 20 of your declaration.

12 Do you recall that?

13 A. Yes.

14 Q. Is it your understanding that the tuning
15 element would be modifying L or C in order to change
16 the resonant frequency?

17 A. That would be a generic understanding.
18 Figure 1 just shows a box called "tuning
19 capacitive/inductive." It's hard to ascertain
20 what's going on inside the box.

21 I believe the Cook patent describes Figure
22 1 as a block diagram.

23 Q. The -- your equation lists the resonant
24 frequency as $1 \text{ over the square root of } L \text{ times } C$; is
25 that right?

1 A. Yes.

2 Q. Are there any parameters other than L and C
3 that could be changed to modify the resonant
4 frequency of the antenna?

5 A. Well, you're asking a very specific
6 question and trying to tie it to a very general
7 formula. So if you look at the $1/LC$ equation -- and
8 that was, I think we said, paragraph 20.

9 Q. That's right.

10 A. Yeah. That equation in paragraph 20 is
11 very generic, and the L and C in that equation
12 represent the equivalent L and the equivalent C that
13 comprise the resonant circuit of the resonator.

14 Q. And the tuning portion of the circuit is
15 going to be varying the equivalent L or equivalent C
16 in order to tune the resonant frequency; is that
17 right?

18 A. I believe that's how a person of skill
19 would understand the function of the operation of
20 the tuning network, but, again, the Cook patent
21 never really says what's inside that box.

22 Q. Now, impedance matching is also changing
23 effective L and C, isn't it?

24 A. Well, what do you mean by effective L and
25 C?

1 Q. I'm -- equivalent L and C. You used the
2 term equivalent L and equivalent C, so let me re-ask
3 the question.

4 Impedance matching is also changing
5 equivalent L and equivalent C in order to match
6 impedance; right?

7 A. Not really. The tuning adjusts the
8 equivalent L and equivalent C that are inside the
9 resonant circuit, and then the matching network
10 looks into the resonant circuit and transforms it
11 into a different impedance seen by the power source.
12 So the matching network isn't really performing the
13 function of tuning.

14 Q. Okay. It's not -- I understand it's not
15 performing the function of tuning. Is it also
16 changing the equivalent L and equivalent C of the
17 resonant circuit, or is it doing something else?

18 MR. LAWSON: Objection to form.

19 THE WITNESS: It -- it is not changing the
20 equivalent L and C of the tuning circuit.

21 By MR. PETERS:

22 Q. You said tuning circuit. Did you mean the
23 resonant circuit?

24 A. Yes. Yes.

25 Q. Okay. Can you go to paragraph 121 of your

1 declaration? Let me know when you're ready.

2 A. Okay.

3 Q. Now, in paragraph 121, in the second
4 sentence, you state, "The tuning network on the
5 transmit power converter in Cook-554," and then you
6 have a parenthetical, and then you say "does not
7 form an impedance matching network of the
8 multi-turning loop."

9 Do you see that?

10 A. I see that.

11 Q. What -- what's the significance of the
12 tuning network not forming an impedance matching
13 network in the context of your statement in
14 paragraph 121?

15 A. One moment. I'm just organizing the pages
16 here.

17 Could you repeat that question?

18 Q. Sure. What's the significance of the
19 tuning network not forming an impedance matching
20 network in the context of your statement in
21 paragraph 121?

22 A. If you see the paragraph that refers to
23 Cook Figure 16. So if you look at Cook Figure 16,
24 the tuning capacitors are all in parallel. That
25 configuration would be known in the trade as a bank

1 of capacitors. And the role of all of the switches,
2 the things labeled RF switches, is to choose one or
3 more of those capacitors to be put in parallel so
4 that equivalent capacitance of that bank resonates
5 with the antenna loop hole, and that's called the
6 antireactor capacitant 1610 to set the resonant
7 frequency of the resonator circuit.

8 And that -- that said, there is -- there is
9 no matching going on between the low impedance power
10 stage in Figure 16, the half bridge, and the rest of
11 the circuit on the right that it's driving.

12 Q. Why does that mean that it's not a part of
13 the resonator --

14 A. Let's see.

15 Q. -- if that is your contention in this
16 paragraph?

17 MR. LAWSON: Counsel, when you said "in
18 this paragraph", are you talking about paragraph 120
19 or 121?

20 MR. PETERS: 121.

21 By MR. PETERS:

22 Q. Let me withdraw that question.

23 In paragraph 121, do you contend that the
24 tuning network is not part of the resonator in
25 Figure 13 of Cook-554?

1 A. Yes. I was actually looking for Figure 13
2 and have now found it.

3 The resonator is contained within the
4 dotted box on the right comprising the high voltage
5 capacitor and multi-turn loop. And then the tuning
6 network is separated from that resonant circuit
7 by an --

8 (Zoom distortion)

9 (Court Reporter clarification.)

10 MR. LAWSON: The tuning network.

11 THE WITNESS: The tuning network. The
12 tuning network is separated from the resonant
13 circuit by the resonator by two things: One is the
14 antenna current circuit 1360 and the other is the
15 antenna feeder cable or transmission line, as it
16 would be generically called 1309.

17 So the tuning network is not contained
18 inside the dotted box 1310, which Cook terms the
19 transmit antenna unit.

20 By MR. PETERS:

21 Q. And it's your opinion that the transmit
22 antenna unit is the resonator in Figure 13; is that
23 right?

24 A. Right.

25 Q. Now, do you contend that the tuning network

1 is not connected to the multi-turn loop in Figure
2 13?

3 A. It is not directly connected to the
4 multi-turn loop.

5 Q. Okay. And that brings me to my next
6 question, which is at the bottom of paragraph 121,
7 you reproduced some language from Claim 17, as
8 requiring at least one of the resonators includes a
9 coil of a plurality of turns of a conducting
10 material connected to a network of capacitors.

11 My question is, does Claim 17 require the
12 coil to be directly connected to the network of
13 capacitors?

14 A. The claim uses the word "connected to" --
15 connected to a network of capacitors.

16 Q. So is that a "no"?

17 A. Does it require -- your question was does
18 it require the coil of a plurality of turns of a
19 conducting material to be connected to a network of
20 capacitors?

21 Q. To be directly connected.

22 MR. LAWSON: Object to the form of the
23 question to the extent it calls for a legal
24 conclusion.

25 THE WITNESS: Tell me what you mean by

1 "connected."

2 By MR. PETERS:

3 Q. The claim recites the word "connected"; is
4 that right?

5 A. Yes.

6 Q. Do you have an understanding of what
7 "connected" means in Claim 17?

8 A. Well, I would refer you to the various
9 figures in the '719 patent that show a network of
10 capacitors, beginning with Figure 30 continuing on
11 through Figure 35.

12 And in that -- in those cases the network
13 of capacitors is shown to be schematically connected
14 to the multi-turn loop for inductance denoted by the
15 simple capital L. So that's what Figure 33 shows as
16 connected.

17 If you compare that to Figure 13 of
18 Cook-554, as I noted, there is no direct
19 connectional path between the tuning network and the
20 multi-turn loop because the antenna feeder cable is
21 in between, as well as the antenna current circuit.

22 Q. Okay. So I asked you about Claim 17, and
23 you referred me to Figure 33. You referred me to
24 Cook. Is it your position that Claim 17 requires a
25 direct connection?

1 MR. LAWSON: Object to the form.

2 THE WITNESS: My understanding of that
3 claim is the network of capacitors has to be
4 electrically connected with no intervening circuits
5 or other components to the resonator.

6 By MR. PETERS:

7 Q. Is that different than a direct connection?

8 MR. LAWSON: Object to the form.

9 THE WITNESS: Well, to me, it means that
10 the network of capacitors has to be connected to the
11 resonator by wires that go from the network of
12 capacitors to the resonator coil.

13 By MR. PETERS:

14 Q. What is a direct connection?

15 MR. LAWSON: Object to the form.

16 THE WITNESS: Topologically it means that
17 one node of the circuit is connected by a wire to
18 another node of the circuit. That's what a direct
19 connection means.

20 By MR. PETERS:

21 Q. Is an antenna feeder cable not a wire?

22 A. It is not.

23 Q. Why not?

24 A. It is a transmission line that has
25 impedance properties beyond a simple wire

1 connection.

2 Q. So the transmit antenna unit is not
3 directly connected to anything in Figure 13; is that
4 right?

5 A. Well, it's directly connected to the
6 antenna -- antenna feeder cable.

7 Q. So even if there was a network of
8 capacitors, under your understanding of that term,
9 in the red box it wouldn't satisfy the claim because
10 it's not directly connected to the transmit antenna
11 unit; is that right?

12 MR. LAWSON: Object to the form.

13 THE WITNESS: Can you repeat that question?

14 By MR. PETERS:

15 Q. Sure. If the tuning network was a network
16 of capacitors; right?

17 A. Yes.

18 Q. It's your position in paragraph 121 that it
19 would not satisfy the claim because it's not
20 directly connected to the transmit antenna unit; is
21 that right?

22 MR. LAWSON: Object to the form.

23 THE WITNESS: I would say it's not meeting
24 the requirements of the claim because the right-hand
25 side of the tuning network is connected to the

1 antenna current circuit and the left-hand side to
2 the half bridge inverter, and one has to go through
3 two different components to get to the multi-turn
4 loop.

5 By MR. PETERS:

6 Q. Let's look at page 72 of your declaration,
7 where you've reproduced or annotated Figure 15?

8 A. Yes.

9 Q. Is the tuning and matching network in
10 Figure 15 directly connected to the receive antenna
11 unit?

12 A. No, I don't believe so.

13 Q. Why is that?

14 A. Well, in Figure 15, we have the same
15 situation as in Figure 13, except on the input side
16 of the circuit, and the tuning and matching network
17 is connected on the right-hand side to the rectifier
18 and on the left-hand side to the current sense
19 circuit and then also to the antenna feeder cable.

20 Q. Got it. So in the top path between the
21 tuning and matching network and the receiving
22 antenna unit, it's not directly connected because of
23 the antenna feeder cable; is that right?

24 MR. LAWSON: Object to the form.

25 THE WITNESS: Directly connected -- it's

1 not directly connected because of the antenna feeder
2 cable.

3 By MR. PETERS:

4 Q. You said the antenna feeder cable is the --
5 not a wire because it has impedance properties
6 beyond a simple wire connection?

7 A. Yes.

8 Q. What properties are you referring to?

9 A. An antenna feeder cable is a two-port
10 network, whereby if you look into one side or one
11 port of the cable with nothing connected to the
12 other side, you see a characteristic impedance of
13 that cable. If you look at the feeder cable from
14 the other side, you see the same characteristic
15 impedance.

16 If you connect circuitry to both sides of
17 the cable, then the cable has an effect on the
18 voltage and current that flow through it because of
19 its inherent impedance.

20 Q. And it's your opinion that Claim 17
21 precludes the use of a transmission line between the
22 capacitor network and the resonator?

23 MR. LAWSON: Object to the form.

24 THE WITNESS: Well, I -- I stand by what I
25 said before in Figure 16 -- 15, rather. The tuning

1 and matching network is not connected directly to
2 what Cook has termed the receiver -- receive antenna
3 unit. So not directly connected to the resonator in
4 Figure 15.

5 By MR. PETERS:

6 Q. Do you dispute that the tuning and matching
7 network in Figure 15 performs an impedance matching
8 network for the multi-turn loop?

9 MR. LAWSON: Objection to form.

10 THE WITNESS: It performs impedance
11 matching so that the -- its input terminals can be
12 matched to the -- to its output terminals, which go
13 to the rectifier and then on to the DC -- to the DC
14 or DC to AC converter, which is block 1515.

15 By MR. PETERS:

16 Q. So it performs impedance matching?

17 A. Between its left-hand input port and its
18 right-hand output port.

19 Q. And I think we went over this earlier, but
20 it's your expert opinion that impedance matching
21 requires providing two degrees of freedom?

22 A. Generally it does. In the context of
23 impedance matching, as it's discussed in the '719
24 patent, it does.

25 Q. Does the '719 patent perform impedance

1 matching in a way that's different than the general
2 understanding of impedance matching?

3 MR. LAWSON: Object to the form.

4 THE WITNESS: What do you mean by "general
5 understanding"?

6 By MR. PETERS:

7 Q. Well, I asked if impedance matching
8 requires providing two degrees of freedom. You said
9 generally it does. So what did you mean by that?
10 What are the exceptions to that?

11 A. Well, there aren't exceptions. There are
12 special cases. So if the load that you're trying to
13 match is purely resistive, no reactive component at
14 all, then you don't need a network of capacitors to
15 do the matching. You can match with simple -- a
16 much simpler matching network that doesn't require
17 degrees of freedom.

18 Q. Figure 15 doesn't show a load that's purely
19 resistive; right?

20 A. The load consists of the rectifier, which
21 passes the circuit on to block 1550, which would
22 typically be an inverter. So these are basically --
23 the inverter would be made of switches, which the
24 first order looked like short-circuits, the same
25 with the diodes and the rectifier.

1 So it sees the load going into the DC
2 output on the far right, and the load would be
3 1559 -- I'm sorry -- 1599.

4 Q. So is that a purely resistive load?

5 A. Well, it depends on whether the output is a
6 DC output or an AC output.

7 Q. Okay. Let's say it's a DC output. Is that
8 a purely resistive load?

9 MR. LAWSON: Object to the form.

10 You can answer

11 THE WITNESS: If the output is a DC voltage
12 and current that only the resistive portion of the
13 load matters, the reactive component doesn't matter
14 at all.

15 By MR. PETERS:

16 Q. So are you saying there is no reactive
17 component or that -- well, let me withdraw that.

18 Are you saying it is a purely resistive
19 load in that case?

20 MR. LAWSON: Object to the form.

21 THE WITNESS: The patent -- Cook patent
22 just says 1599 is the load, without specifying
23 whether it has a reactive component or not. So I
24 don't think you can say it only has a resistive
25 component if the output of the converter circuit is

1 a voltage.

2 By MR. PETERS:

3 Q. So it might be, it might not be, is that
4 your opinion?

5 MR. LAWSON: Object to the form.

6 THE WITNESS: The patent doesn't say. What
7 I said previously was that if there is a reactive
8 component to the load 1599, in the case of a DC
9 output from the converter unit, the reactive
10 component doesn't matter because it won't affect the
11 impedance seen at the input to the load for DC
12 signals.

13 By MR. PETERS:

14 Q. So in order to do impedance matching for
15 this circuit if the output is DC, the matching
16 network does not need to provide two degrees of
17 freedom; is that right?

18 MR. LAWSON: Object to the form.

19 THE WITNESS: I'm sorry. Ask that question
20 again.

21 By MR. PETERS:

22 Q. In order for the tuning and matching
23 network to perform impedance matching in Figure 15
24 with a DC output, the tuning and matching network
25 does not need to provide two degrees of freedom; is

1 that right?

2 MR. LAWSON: Object to the form.

3 THE WITNESS: Whether it needs two degrees
4 of freedom or not is going to depend on what the
5 impedance -- whether impedance sees looking into the
6 rectifier circuit.

7 By MR. PETERS:

8 Q. And I believe your testimony was that with
9 the DC output, it's going to see a real impedance;
10 is that right?

11 A. I said the inverter 1550, the DC to DC
12 converter, that would not care about what the
13 reactive component was of the load 1599. I'm saying
14 that's true about the input to the DC to DC
15 converter.

16 Q. Just to clarify, did you just say I'm not
17 saying that's true about the input to the DC to DC
18 converter or it is true?

19 A. Let me say it again.

20 What I said previously was that the output
21 of the DC to DC converter 1550 sees the load 1599,
22 and if the load has a reactive component, it's not
23 going to affect the current that flows out of the DC
24 to DC converter.

25 The same is not true about what the tuning

1 and matching network sees looking into the DC to DC
2 converter, because the input side is much different
3 than the output side for block 1550.

4 Q. Okay. So when I asked you what the load is
5 or about the load in Figure 15, you included the
6 rectifier and everything afterwards up to 1599;
7 right? So this question is about that definition of
8 load. It's what the tuning and matching network is
9 seeing. Is that --

10 (Zoom cross-talk)

11 THE WITNESS: I'm sorry. Repeat the
12 question.

13 (Court Reporter clarification)

14 MR. LAWSON: No. I said let him -- let Mr.
15 Peters finish his question. I interrupted him.

16 By MR. PETERS:

17 Q. Oh, okay. Sure.

18 Is the impedance that the tuning and
19 matching network sees going to be purely resistive
20 in Figure 15?

21 MR. LAWSON: Object to the form.

22 THE WITNESS: I -- I don't believe that can
23 be said as a general statement. It's going to
24 depend on many different things.

25 And just to clarify, in speaking about the

1 load of 1599, I am talking about the ultimate load
2 being driven by the whole receive power converter
3 unit. That said, any circuit with an input port and
4 an output port, such as the tuning and matching
5 network, drives some kind of load locally. So if I
6 refer to what's connected to the yellow box as the
7 load, I mean the -- the impedance that it is
8 driving, looking into the rectifier. But the
9 ultimate load for the whole system is the box 1599
10 way over on the right.

11 By MR. PETERS:

12 Q. Now, what is the load that the matching
13 network is matching impedance for?

14 MR. LAWSON: Object to the form.

15 THE WITNESS: It is matching the circuit
16 looking into the left-hand side of the rectifier
17 block.

18 By MR. PETERS:

19 Q. Okay. And you previously stated that that
20 circuit looking into the left-hand side of the
21 rectifier block can't be said in general to be
22 purely resistive; is that right?

23 MR. LAWSON: Object to the form.

24 THE WITNESS: I believe that's so.

25 By MR. PETERS:

1 Q. Now, for the matching network to perform
2 impedance matching on that circuit, it has to
3 provide two degrees of freedom if it's not purely
4 resistive; correct?

5 MR. LAWSON: Object to the form.

6 THE WITNESS: Well, that depends on what
7 you want the input to the tuning and matching
8 network to look like, as seen as its input port.
9 And if you only care about it being some resistive
10 value, you can cancel out the reactive component
11 seen by the tuning and matching network with just
12 one degree of freedom. Doing so would allow you to
13 have the output impedance of the tuning and matching
14 network be the complex conjugate of the import
15 impedance of the rectifier.

16 By MR. PETERS:

17 Q. So it's your position that you can -- hold
18 on a second. Let me withdraw that question.

19 It's your testimony now that transforming
20 this complex impedance into a completely real value
21 can be done with one degree of freedom?

22 MR. LAWSON: Object to the form.

23 THE WITNESS: What I said was you can take
24 a circuit having one degree of freedom and turn the
25 impedance it sees into some real value. It may not

1 be the real value to which -- that you want to set
2 it to, but you can get some real value with only one
3 degree of freedom.

4 If you want to match the input impedance to
5 the output impedance of the antenna, receive unit
6 by way of the transmission line, then the problem
7 becomes more complicated, and you may or may not
8 want just a simple resistive input impedance into
9 the tuning and matching network. You may want a
10 very specific input resistance looking into -- into
11 the yellow box.

12 By MR. PETERS:

13 Q. To perform that matching, you'll need two
14 degrees of freedom; right?

15 A. That, again, is going to depend on what the
16 tuning and matching network sees looking into the
17 rectifier.

18 Q. So is it not your opinion that impedance
19 matching requires two degrees of freedom?

20 MR. LAWSON: Object to form.

21 THE WITNESS: In the context of the network
22 of capacitors question, we need two degrees of
23 freedom to turn -- to transform the load impedance
24 into a specific input impedance seen looking into
25 the matching network. And what I'm saying is that

1 with only one degree of freedom, you can't turn --
2 you can't transform the impedance seen looking into
3 the yellow box to any arbitrary value that you want.
4 You can turn it into some real input impedance, and
5 whatever that value is depends on other factors in
6 the whole circuit.

7 By MR. PETERS:

8 Q. That wouldn't be matching; right? If -- if
9 you only had one degree of freedom, you couldn't
10 match the impedance?

11 MR. LAWSON: Object to the form.

12 THE WITNESS: Well, you have to ask match
13 the impedance to what? And in Figure 15 you have a
14 feeder cable with its own output impedance; so, you
15 know, if the -- if the tuning and matching network
16 is not connected to the multi-turn of the resonator,
17 you know, what are you matching to what?

18 By MR. PETERS:

19 Q. Do you know?

20 A. Well, I don't -- I don't know what's
21 happening in Cook.

22 Q. Well, when Cook says "impedance matching",
23 you don't know what that means?

24 MR. LAWSON: Object to the form.

25 THE WITNESS: I could not find an

1 explanation of what Cook means by matching, other
2 than using the word "matching" to describe the
3 yellow box.

4 By MR. PETERS:

5 Q. A person of ordinary skill in the art
6 wouldn't have an understanding of matching?

7 MR. LAWSON: Object to the form.

8 THE WITNESS: You're -- you're asking me
9 that question, what a person skilled in the art
10 would understand about matching, and without further
11 information, meaning matching with a network of
12 capacitors, then, you know, that person of skill
13 would need that added information to understand what
14 matching does in the context of -- means in the
15 context of the '719 patent.

16 So as I said before, matching just means
17 getting rid of the reactive component seen by the --
18 the driving source, the antenna in this case. You
19 can do that with one degree of freedom. If you want
20 to match the real components of the driving source
21 and what's presented by the matching network, in
22 general you need two degrees of freedom.

23 By MR. PETERS:

24 Q. So the term "impedance matching" can mean
25 driving just the complex value of impedance to

1 zero?

2 MR. LAWSON: Object to the form.

3 THE WITNESS: I think, again, it depends on
4 the context.

5 By MR. PETERS:

6 Q. The context of Cook.

7 A. Well, certainly the context of Cook, but
8 more generally, I think your question was about how
9 a person of skill would interpret matching network.

10 If you had a circuit where there were no
11 reactive components at all, just resistive
12 components, and the typical example is -- would be
13 the old days of -- of a stereo system, where
14 impedances were all resistors. Your amplifier would
15 have a certain output impedance, and the speaker
16 would have a certain input impedance, and the goal
17 was always to match one to the other, and those
18 impedances would just be resistors. But that's one
19 type of matching.

20 And, you know, another is to have the
21 simple match, where you just want to convert a
22 complex impedance into the closest real impedance
23 you can get. And another form of matching is to
24 transform a complex impedance into a real impedance
25 at a specific target value.

1 And I think a person of ordinary skill
2 would understand all three of those scenarios,
3 depending on the context of the circuit to which
4 matching is being applied.

5 Q. In a simple match, where you just convert a
6 complex impedance into the closest real impedance
7 you can get, you only need one degree of freedom; is
8 that right?

9 MR. LAWSON: Object to the form.

10 THE WITNESS: I think I misspoke with the
11 words "the closest resistive component" because that
12 implies closest to what? What I mean is that you
13 can transform the complex impedance into some value
14 of a real impedance, and what that value is is going
15 to depend on the -- the -- what the reactive
16 component is of the load and what the real component
17 is of the load. Excuse me.

18 By MR. PETERS:

19 Q. Okay. So in a simple match where you are
20 transforming the complex impedance into some value
21 of a real impedance, that can be accomplished with
22 one degree of freedom; correct?

23 A. Yes.

24 MR. LAWSON: Object to the form.

25 By MR. PETERS:

1 Q. And the -- in the case where you want to
2 transform a complex impedance into a real impedance
3 at a specific target value, that requires two
4 degrees of freedom; is that right?

5 MR. LAWSON: Object to the form.

6 THE WITNESS: That's generally true unless
7 you happen to get lucky and with one degree of
8 freedom, you get the resistive impedance you want.
9 But more generally, you need two degrees of freedom
10 in order to arrive at the specific real value of
11 impedance that you want to see looking into the
12 matching network.

13 By MR. PETERS:

14 Q. Let's look at Figure 4 of Cook-554.

15 A. Okay.

16 Q. Have you seen this figure before?

17 A. Yes.

18 Q. Now, Figure 4 illustrates several devices.

19 Do you see that?

20 A. Did you -- did you say mobile devices?

21 Q. Is no several. Several devices.

22 A. Yes, it does.

23 Q. And, in fact, it discloses several portable
24 devices; right?

25 A. That's right.

1 Q. Each of these devices has an integrated
2 antenna; is that right?

3 MR. LAWSON: Object to the form.

4 THE WITNESS: What do you mean by
5 "integrated"?

6 By MR. PETERS:

7 Q. Well, let's look at the flat screen socket.
8 It says "transmit antenna, integrated in
9 screen socket." Do you see that?

10 A. Yes.

11 Q. So is it your understanding that the screen
12 socket has a transmit antenna integrated into it?

13 MR. LAWSON: Object to form.

14 THE WITNESS: That's what the label says.

15 By MR. PETERS:

16 Q. Now, is it your understanding that the
17 wireless keyboard has an antenna integrated into
18 it?

19 MR. LAWSON: Object to the form.

20 By MR. PETERS:

21 Q. I can refer you to column 8, starting at
22 line 58 going to column 9, roughly line 10 or so.

23 A. Would you repeat your question, please.

24 Q. Is it your understanding that the wireless
25 keyboard in Figure 4 has an antenna integrated into

1 it?

2 A. Well, the '554 simply says that the
3 keyboard has an internal antenna. I refer you to
4 column 9, lines 1 and 2.

5 Q. Do you disagree that an internal antenna is
6 integrated into a device?

7 MR. LAWSON: Object to the form.

8 THE WITNESS: I think something being
9 internal is not the same as -- necessarily the same
10 thing as being integrated.

11 By MR. PETERS:

12 Q. Well, I understand your position that
13 "integrated" doesn't necessarily mean "internal."
14 Is it your position also that "internal" does not
15 mean "integrated"?

16 MR. LAWSON: Object to the form.

17 THE WITNESS: Usually "integrated" means
18 it's whatever is integrated is more of a structural
19 component of the host rather than of something that
20 is incidentally attached to it.

21 And, for example, column 8, line 60 to 61,
22 in talking about the antenna of the screen, it
23 says -- starting at column 60, "The base may be
24 misshaped and may embed a circuit or wire loop
25 antenna to generate a substantially vertically

1 polarized magnetic field."

2 So saying that -- well, the wire loop is
3 embedded in the base of the screen, and then for the
4 keyboard, it simply says that the antenna is
5 internal.

6 By MR. PETERS:

7 Q. Uh-huh. So it's -- an internal antenna is
8 not integrated?

9 MR. LAWSON: Object to the form.

10 THE WITNESS: I think what I said was it
11 depended on whether by being internal, it became --
12 it's a structural element of whatever is hosting the
13 antenna.

14 By MR. PETERS:

15 Q. You don't have -- you don't have enough
16 information to determine whether the internal
17 antenna is integrated into the keyboard; is that
18 right?

19 A. Not in this excerpt from the '554 patent.

20 Q. Okay. Now look at column 9, starting at
21 line 20, where it's referencing Figure 6 and 7, and
22 it says, "This embodiment may embed a parasitic
23 antenna into a charging base that relays the
24 wireless power to an internal antenna (705 in the
25 portable device (710))."

1 Do you see that?

2 A. Yes.

3 Q. Did you consider this passage when you
4 wrote your declaration?

5 A. Well, I -- I read -- I read this passage.
6 I believe I did not cite it when I wrote my
7 declaration.

8 Q. But you did consider it in forming your
9 opinions?

10 A. Is there a specific portion of my report to
11 which you're referring?

12 Q. Namely, your opinion that "Cook does not
13 disclose an antenna that's enclosed in a material."

14 MR. LAWSON: Object to the form.

15 THE WITNESS: Could you direct me to any
16 point in my declaration where I said that?
17 Otherwise, I will just read through it.

18 By MR. PETERS:

19 Q. Sure. Paragraph 98, second sentence. "My
20 reasons for this opinion are severalfold." That's
21 the second sentence. The third sentence is,
22 first -- I'm sorry. Are you there?

23 A. Now I'm at 98. Could you begin again?

24 Q. Yes. Third sentence of paragraph 98,
25 "First, Cook-554 teaches resonator integrated with a

1 portable electronic device, but Cook-554 does not
2 teach or suggest a resonator that is enclosed in a
3 low loss tangent material."

4 In forming that opinion, did you consider
5 this passage in column 9 related to Figures 6 and
6 7?

7 MR. LAWSON: Object to form.

8 You can answer

9 THE WITNESS: Well, I -- I certainly
10 considered it in the sense that I -- I'm saying that
11 Cook doesn't suggest a resonator enclosed in a low
12 loss tangent material.

13 And the passage we just talked about
14 doesn't disclose the use of a low loss tangent
15 material.

16 By MR. PETERS:

17 Q. Okay. How about the next sentence?
18 "Specifically, Cook-554 does not teach a resonator
19 inside a portable electronic device."

20 Did you consider this passage in column 9
21 when forming that opinion?

22 A. Well, what is talked about in column 9 is
23 the antenna. The antenna is not necessarily a
24 resonator. It's -- a resonator is a circuit that
25 resonates, and an antenna is a circuit that

1 broadcasts a wave that is sent away from the
2 antenna. So these are different things.

3 Q. Okay. Let's look at Figure 7 of Cook-554.

4 MR. LAWSON: Counsel, we've been going
5 about an hour.

6 MR. PETERS: Yeah. Just -- just one
7 more -- one more question, and we'll take a break.

8 MR. LAWSON: Sure.

9 What figure are you referring to, Counsel?

10 MR. PETERS: Figure 7 of Cook-554.

11 THE WITNESS: I'm looking at that figure.

12 By MR. PETERS:

13 Q. Is it your opinion that the ferrite rod
14 antenna 705 in Figure 7 is not a resonator?

15 A. Not enough information is provided. One
16 doesn't know what's driving the ferrite rod.

17 MR. PETERS: Okay. Let's take a 10-minute
18 break.

19 COURT REPORTER: We're off the record.

20 (Recess.)

21 COURT REPORTER: We're back on the record.

22 By MR. PETERS:

23 Q. Dr. Horenstein, during the break, did you
24 speak to counsel about the substance of your
25 testimony?

1 A. No.

2 Q. Turning back to Figure 7 of Cook-554.

3 A. Okay.

4 Q. Do you see that Figure 7 describes ferrite
5 rod antennas integrated into portable device?

6 A. Yes.

7 Q. Do you see that?

8 A. Yes.

9 Q. And that same antenna is annotated at 705?

10 A. Yes.

11 Q. And we previously saw that in column 9,
12 cook described 705 as being internal to the mobile
13 device. Is that -- is that right?

14 A. That's right.

15 Q. So is it your understanding that Figure 7
16 shows antenna 705 as internal to portable device
17 710?

18 A. That's what Cook says.

19 Q. And it's integrated into the device;
20 correct?

21 A. That's what Cook says.

22 Q. Let's go back to Figure 4 just for a
23 moment. Let me know when you're ready.

24 Are you ready, sir?

25 A. Yes.

1 Q. Okay. In Figure 4 do you -- does Figure 4
2 illustrate any external resonant antennas on any of
3 these devices?

4 MR. LAWSON: Object to form.

5 THE WITNESS: I don't see any.

6 By MR. PETERS:

7 Q. Let's turn to -- sorry. Was that the end
8 of your answer?

9 A. Yes.

10 Q. Okay. Let's turn to Figure 21A and 21B of
11 Cook-554. Let me know when you're ready.

12 A. Okay.

13 Q. Did you consider these figures when forming
14 your opinion in paragraph 98 that Cook-554 does not
15 teach a resonator inside a portable electronic
16 device?

17 MR. LAWSON: Object to form.

18 THE WITNESS: 998 of my declaration? You
19 mean 98?

20 By MR. PETERS:

21 Q. Paragraph 98.

22 A. Yes.

23 Q. Now, is it your opinion that Figures 21A
24 and 21B illustrate the sliding coil in the flat core
25 ferrite antenna to be internal to the portable

1 device?

2 A. Well, the side-view of Figure 21B seems to
3 show that sliding coil is inside of the device.

4 Q. Turning to column 19 of Cook, starting at
5 line 36.

6 A. Okay.

7 Q. Actually, line 37. It says, "At HF, both
8 eddy currents and dielectric losses may degrade the
9 Q-factor."

10 What are dielectric losses in this
11 context?

12 A. We're talking about line 37?

13 MR. LAWSON: In column 19.

14 THE WITNESS: In column 19.

15 By MR. PETERS:

16 Q. Yeah. Are you with me?

17 A. Yes. So what is your question?

18 Q. What are dielectric losses in this
19 sentence?

20 A. Dielectric losses are energy losses
21 associated with the loss tangent that's caused by
22 molecular friction when the molecules or atoms in
23 the dielectric interact with the electric field
24 that's going through the dielectric.

25 Q. So a material that has lower -- a low loss

1 tangent would have lower dielectric losses in
2 general?

3 MR. LAWSON: Object to -- object to the
4 form.

5 THE WITNESS: That's right.

6 By MR. PETERS:

7 Q. I'm going to enter Exhibit 1006 into the
8 chat. Please open it up and let me know when you're
9 ready.

10 (Whereupon, Horenstein Exhibit 1006 was marked for
11 identification.)

12 THE WITNESS: Okay.

13 By MR. PETERS:

14 Q. If you go to -- it's page 56 of the PDF of
15 Exhibit 1006.

16 A. Did you say 56?

17 Q. That's right.

18 A. Okay.

19 Q. At the bottom of page 56, there is what is
20 illustrated, or labeled, as Figure 5-6 on the next
21 page. This seems to correspond with Figure 21A and
22 21B of Cook-554; is that right?

23 A. Yes.

24 Q. Okay. And so this figure on page 56 also
25 illustrates that the sliding coil and ferrite

1 antenna is inside the portable device; is that
2 right?

3 A. That's right.

4 Q. Okay. Let's go back to Cook-554, Exhibit
5 1005, and let's look at Figure 15.

6 A. Of '554?

7 Q. Yes.

8 A. Give me one moment. You said Figure 15,
9 did you say?

10 Q. Yeah, that's right.

11 A. Okay.

12 Q. When we talked about this figure before,
13 you mentioned that the tuning and matching network
14 was -- was connected to the multi-turn loop through
15 the antenna feeder cable and the antenna current
16 sense.

17 Do you recall that?

18 A. Right.

19 Q. What is the antenna current sense in Figure
20 15?

21 A. It senses the current that's flowing
22 through the wire going into the matching network.

23 Q. How does current flow through the wire in
24 the circuit?

25 A. I'm not sure I understand your question.

1 Q. Well, flowing current implies power; right?

2 A. Not necessarily.

3 Q. Why not?

4 A. Well, in order to have power flowing, you
5 have to have current that's produced by a voltage,
6 and the power is related to either the simple
7 product or the by-product of the voltage times the
8 current.

9 Q. So is it possible to have a current that's
10 not produced by a voltage?

11 A. It's -- it's possible in some cases.

12 Q. And what cases would those be?

13 A. Well, if one had a closed loop that had a
14 voltage induced by a magnetic field, then the
15 current would flow. Of course, the case of, say,
16 the superconductor with zero resistance, admittedly
17 not relevant to the subject matter here.

18 Q. When you say "closed loop that had a
19 voltage induced by a magnetic field", is that -- is
20 that not a current that's produced by a voltage?

21 A. A little bit more complicated than that.

22 Q. Okay. How -- how is it more complicated?

23 A. One has to consider the energy flowing by
24 way of the magnetic field and how it relates to the
25 electric field that it produces. And this is tied

1 up with theoretical theorems, such as Faraday's Law
2 and the Poynting theorem, which sound like they're
3 not relevant here, but they are. They're within the
4 scope of the subject matter here.

5 Q. So does that mean that there is a current
6 with no voltage in that case? That's what you're
7 saying?

8 A. Well, the previous question -- or my answer
9 to your previous question said in -- in a simple
10 circuit, you need a voltage driving a current. And
11 then we got into, you always need a voltage, and I
12 came up with the answer of a voltage induced by a
13 magnetic field. And then the question is, what's
14 the power flow in that situation? And it's not a
15 simple power flow related to a voltage source
16 driving a current.

17 Now you have a voltage induced by a
18 magnetic field that's produced by some other source
19 of magnetic field. So it's a more complicated
20 problem.

21 Q. But there is still a voltage and there is
22 still a current and there is still power, right, a
23 non-zero voltage?

24 A. Well, there's a non-zero -- in the parlance
25 of electromagnetics, it's called the $\mathbf{E} \times \mathbf{B}$

1 vector. That's non zero, and that is what's driving
2 the current.

3 Q. Well, you also said that it's -- there's
4 an -- okay. So you're saying there's a current in
5 the voltage, but the voltage is not necessarily
6 what's driving the current?

7 A. We're -- we're kind of off on the question
8 of inducing a current in a closed -- a closed -- a
9 loop conductor, and that's one way you can produce
10 the current without a voltage source.

11 Q. Okay. Is there a loop conductor in Figure
12 15?

13 A. Hard to say. You don't know what's inside
14 the antenna current sense.

15 Q. Okay. So is there a loop conductor in the
16 receive antenna unit in Figure 15?

17 A. Yes.

18 Q. And the -- the antenna current sense is in
19 series with the multi-turn loop; is that right?

20 A. The -- the box labeled "I" is in series
21 with the wire going to the antenna -- antenna feeder
22 cable.

23 Q. Which is in series with the capacitor and
24 in series with the multi-turn loop; correct?

25 A. Correct.

1 Q. And the power -- sorry. The receive
2 antenna unit is receiving power from the transmit
3 antenna unit; is that right?

4 A. Correct.

5 Q. And that power is -- or at least can be
6 calculated from the voltage and the current that are
7 being induced; is that accurate?

8 A. It's more -- it's more accurate to say that
9 the power being passed on by the receive antenna
10 unit to the rest of the circuit to the right is
11 related to the voltage across the left-hand
12 terminals of the feeder cable times the current
13 going to and from the wires of the feeder cable.
14 Those two parameters would define the power flow
15 from left to right.

16 Q. And the antenna current sense would measure
17 that current; is that right?

18 A. Well, it would measure the current coming
19 out of the right-hand port of the antenna feeder --
20 antenna feeder cable.

21 Q. Can we get Figure -- sorry. Is that --
22 that current that's sensed in the antenna current --
23 let me withdraw that.

24 The current that is sensed by the antenna
25 current sense is based on the power that's received

1 from the receive antenna unit -- by the receive
2 antenna unit; is that right.

3 MR. LAWSON: Object to form.

4 THE WITNESS: It's related to the power is
5 a better way to say it.

6 By MR. PETERS:

7 Q. How is it related to the power?

8 A. Well, again, the power flow is determined
9 by both the voltage and the current appearing at the
10 right-hand port of the feeder cable. So whatever
11 current flows depends on the impedance seen looking
12 into the tuning and matching network, as driven by
13 the voltage appearing at the right-hand side of the
14 feeder cable.

15 So the current -- in this type of circuit,
16 the voltage is the driver and the current is the
17 result.

18 Q. Let's look at Figure 16 again.

19 A. Okay.

20 Q. The twin capacitors in Figure 16, would you
21 agree that there is the -- I'm going to withdraw
22 that.

23 Would you agree that the twin capacitors in
24 Figure 16 form a circuit topology that includes one
25 or more capacitors?

1 A. That lower part of Figure 16 shows one
2 capacitor or two or more capacitors in parallel.

3 Q. Is that --

4 A. That would be -- the specific topology
5 would be capacitors in parallel.

6 Q. Can we go to Figure 22C of Cook-554? And
7 let me know when you're ready.

8 A. Okay. I see it.

9 Q. What is your understanding of what's
10 illustrated in Figure 22C?

11 A. I think the -- the label speaks for itself.
12 It's a clamshell type of phone with a very flat core
13 antenna integrated into the cover or the keyboard
14 portion of the phone.

15 Q. Okay. So you agree that there is a phone
16 in Figure 22C?

17 A. One would suppose -- I suppose, to be
18 thorough, I should check the description of Figure
19 22C to see before declaring it a phone.

20 22C just -- they're called clamshell
21 devices, not specifically phones in the patent. And
22 I can refer you to -- let's see -- column 19, lines
23 44 to 45.

24 Q. Okay. Are you finished with your answer?

25 A. Well, I'm just -- for completeness, column

1 2, lines 47 to 48.

2 Q. Okay. And the clamshell device that's
3 shown in Figure 22C, what's the keyboard part?

4 A. 22C? I think it has to be inferred, but it
5 appears that the upper part of the clamshell has
6 kind of a rectangle resembling a display, and that
7 would suggest that the rectangle with a bunch of
8 whirls and dotted lines on the lower part is a
9 keyboard, the thing with -- I'm sorry. I take that
10 back. The thing with all of the lines is the flat
11 core antenna, and presumably the lower part of the
12 clamshell is where the keyboard is placed.

13 Q. Where would the keyboard be placed in the
14 lower part of the clamshell?

15 A. It doesn't say. Somewhere.

16 Q. Would it be on the outside of the device?

17 A. The keyboard?

18 Q. Yeah.

19 A. Define "keyboard."

20 Q. Do you understand what "keyboard" means in
21 Figure 22C?

22 A. Well, I understand what a keyboard is, and
23 I understand how keyboards work on phones, those few
24 phones that are still left in the world or that
25 existed in the time frame of this patent.

1 The keys are on the outside, but there's a
2 board where the contacts are made, and that's going
3 to be inside of the clamshell. So the keyboard is
4 kind of half inside, half outside.

5 Q. So is it your understanding that the
6 ferrite flat core antenna in Figure 22C is exposed
7 on the outside of the clamshell device?

8 A. Cook doesn't really say.

9 Q. So you don't have any understanding as to
10 whether the ferrite flat core antenna is exposed in
11 Figure 22C?

12 A. Well, it could be on the back of the lower
13 flap of the clamshell, and evidence that that is
14 possible is shown in Figure 22D, where what is shown
15 is a single device that's not a clamshell. It's
16 just one handheld device, such as a phone, and it
17 would appear the ferrite antenna is covering the
18 display, which is not the way it would be made. So
19 one can infer that the rectangle with lines
20 representing the flat core antenna is placed just to
21 show its position relative to the rest of the
22 structure, but it could be on the backside of the
23 structure shown.

24 But certainly that's going to be true in
25 Figure 22D, because the antenna is not going to be

1 in front of the display. And so the same situation
2 could be true for 22C, that the antenna is on the
3 backside. It kind of makes sense because you don't
4 want to be having the antenna on the outside surface
5 of one half of the clamshell because then when you
6 close it, the antenna is kind of crushed in the
7 middle.

8 Bottom line is, Cook doesn't really say
9 whether the antenna is outside of the cover or
10 inside the cover.

11 Q. Well, let's step back. So you would agree,
12 at least, that the ferrite flat core antenna is not
13 covering up the display in Figure 22D; right?

14 A. I think a person of skill would reach that
15 conclusion because it would not be a good design if
16 the display was covered by the antenna so you
17 couldn't see the display.

18 Q. And Figure 22C, you agree that the ferrite
19 flat core antenna is not covering up the keyboard,
20 is that right, or at least the keys?

21 A. That would be a fair assumption.

22 Q. And you said it could be on the back.
23 Could it also be inside the device?

24 A. It could be inside the device or it could
25 be mounted on the back of a device.

1 Q. You mentioned phones at the time of this
2 patent. I am guessing that you have personal
3 experience with these types of clamshell phones?

4 A. That's right.

5 Q. In your experience, are there typically
6 exposed to electronics in these devices?

7 MR. LAWSON: Object to the form.

8 THE WITNESS: Well, let me say I didn't own
9 a phone with the antenna on the outside.

10 By MR. PETERS:

11 Q. What about other electronics? Were other
12 electronics exposed?

13 MR. LAWSON: Object to the form.

14 THE WITNESS: I'm sorry. You mean the
15 electronics of the phone?

16 By MR. PETERS:

17 Q. Right. Were they exposed outside the
18 cover?

19 MR. LAWSON: Object to form.

20 THE WITNESS: Not in any of the three
21 phones that I owned in that time span.

22 By MR. PETERS:

23 Q. Okay. I'm going to introduce Exhibit 1007
24 into the chat. It is Cook-523. Please open it up
25 and let me know when you're ready.

1 (Whereupon, Horenstein Exhibit 1007 was marked for
2 identification.)

3 THE WITNESS: Okay.

4 By MR. PETERS:

5 Q. Could you turn to Figure 13 in B of
6 Cook-523?

7 A. Sorry. You said 13B?

8 Q. That's right.

9 A. All right.

10 Q. Is it your opinion that the metallic case
11 in Figure 13B is meant to be the outer enclosure of
12 a mobile phone?

13 A. I believe that is the case.

14 Q. And so it's your opinion that Cook-523 is
15 teaching having an opening inside of the mobile
16 phone at the top and bottom of the case?

17 A. What I see in 13B is a slot -- that's the
18 thing labeled "slot" -- and also the ends of the
19 structure appear to be open relative to the metallic
20 case.

21 Q. And it's your opinion that those openings
22 will be openings of the phone's enclosure; is that
23 right?

24 A. Well, they're going to be openings in the
25 metallic case.

1 Q. And you previously testified that the
2 metallic case is the outer enclosure of the mobile
3 phone.

4 A. Well, let me rephrase that. It would be
5 one component of the outer case of a mobile phone.

6 Q. Okay. So it's your understanding that the
7 mobile phone would have other components that are
8 not shown in Figure 13B?

9 A. Sorry. Let me withdraw that.

10 It's your understanding that the enclosure
11 of the mobile phone would have other components that
12 are not shown in Figure 13B?

13 A. Right.

14 Q. Would those components have -- cover the
15 slot?

16 A. Well, Cook doesn't say whether they cover
17 the slot or not, but it would be likely that the
18 slot would be covered by some non-conducting
19 material.

20 Q. Is it likely that the openings on either
21 side would also be covered by some non-conducting
22 material?

23 A. Right.

24 Q. Let's go back to your declaration, and
25 let's look at paragraph 37.

1 A. Okay. I'm looking at it.

2 Q. Sorry. In paragraph 37, you say that "The
3 claim term 'network of capacitors' has a very
4 specific meaning in the '719 patent."

5 Do you see that?

6 A. Yes.

7 Q. Is it your opinion that be the term
8 "network of capacitors" is used differently in the
9 '719 patent than its normal use in the field?

10 A. I'm not sure there is a normal use in the
11 field.

12 Q. Okay. So there's not a plain meaning to
13 "network of capacitors"?

14 MR. LAWSON: Object to form.

15 THE WITNESS: There's a plain meaning to
16 "network", and there's a main meaning for
17 "capacitors", but the aggregate term "network of
18 capacitors", I don't think is a common term.

19 By MR. PETERS:

20 Q. Is it your opinion, then, that the '719
21 patent directly defines the term "network of
22 capacitors?"

23 Did you hear my question, sir?

24 A. Yes, I did.

25 Q. Are you waiting for something?

1 A. I'm looking at the patents.

2 Q. Okay.

3 A. You asked me if the "network of capacitors"
4 was defined in the patent.

5 Q. Are you able to answer that question, sir?

6 A. Yes.

7 Q. Are you able to answer that question
8 without reading the entire patent?

9 A. I -- I'm going to read what I need to read
10 to answer your question.

11 Q. Where are you reading from?

12 A. At the moment column 5. I was reading some
13 columns before. I think one of the places where
14 it's defined is in column 5, between lines 49 to 52.
15 I'll read it.

16 "The first network of capacitors and the
17 second network of capacitors may be adjustable to
18 match the coil to the characteristic impedance of
19 the power generator or the load at a driving
20 frequency of the power generator."

21 So what it's saying is the job of the
22 network of capacitors is to do the matching between
23 the source and the load, which is the way we've
24 described matching network in the context of the
25 '719 patent prior to this moment.

1 Q. And that sentence says "may be adjustable";
2 is that right?

3 A. It does say "may be adjustable."

4 Q. *In paragraph 37, you quote Exhibit 2013 --
5 are you with me?

6 A. Yes.

7 Q. -- as defining a network "as a circuit made
8 up of resistances, inductances, mutual inductances
9 and capacities (capacitors) connected together in
10 some manner."

11 Is that consistent with your understanding
12 of what a network is?

13 A. Well, that is consistent -- it's consistent
14 with my understanding of what "network" means.

15 Q. Let's go to column 52 of the '719 patent,
16 and look at line -- starting around line 32.

17 A. All right. Did you say 72?

18 Q. No. I'm sorry. Column 52, starting at
19 line 32.

20 MR. LAWSON: I'm sorry, Counsel. This is
21 the '719 patent now we're going to?

22 MR. PETERS: Yes.

23 MR. LAWSON: All right.

24 THE WITNESS: Column 52, line -- what line
25 did you say?

1 By MR. PETERS:

2 Q. 32.

3 A. 32.

4 Q. Are you with me?

5 A. Yes.

6 Q. All right. It says, "It will be
7 appreciated that a network of capacitors, as used
8 herein, may in general refer to any circuit
9 topology, including one or more capacitors", and it
10 goes on from there.

11 Do you see that?

12 A. That's right.

13 Q. Do you understand that sentence to be a
14 definition of the term "network capa- -- network of
15 capacitors"?

16 A. No. What that sentence does is generalize
17 the concept of network capacitors to include all of
18 the various topologies shown in figures starting
19 with 30, 30 to 35, wherein all of those networks
20 with multiple degrees of freedom may have variable
21 inductors instead of variable capacitors and may
22 include inductors in general together with
23 capacitors. And all of those circuits perform the
24 same function of matching circuits.

25 And my interpretation of the passage we

1 looked at in the '719 patent just now is to take the
2 term "network of capacitors", as used in the claim,
3 and expand it to include all of the various circuits
4 in the figures that I -- that I cited.

5 Q. You cited Figures 30 through 35, but this
6 sentence doesn't mention any specific figures, does
7 it?

8 A. Hang on. I'm getting back to the --
9 they're -- they're discussed above in the column
10 starting at now -- we're at column 52, line 16,
11 which starts -- the paragraph starts, "As Figure 30
12 shows six examples, A to F, of directly-coupled
13 impedance-matching circuits." And then the
14 specifics of Circuits A, B, C, H, I, J, and then the
15 other circuits are described later on, complete with
16 lots of mathematics.

17 So my -- my take on the passage start with
18 paragraph -- the portion starting at line 32 is that
19 it's describing all of the circuit topologies that
20 are mentioned before and after that particular
21 excerpt.

22 Q. Okay. Let's look at Figure 36.

23 A. Okay.

24 Q. You would agree that Figure 36 illustrates
25 capacitors; correct?

1 A. That's correct.

2 Q. It illustrates circuit topology, including
3 one or more capacitors?

4 A. That's right.

5 Q. But my understanding is you would -- my
6 understanding is your testimony would not include
7 any of the figures shown in Figure 36 as a network
8 of capacitors; is that right?

9 A. One moment. So Figure 36 is explained in
10 column 10. It says, "Figures 36A through -D depict
11 four topologies of networks." It doesn't say
12 "networks of capacitors." It says "networks of
13 fixed and variable capacitors designed to produce an
14 overall variable capacitance with finer tuning
15 resolution and some with reduced voltage on the
16 variable capacitor."

17 Figure 36 is disclosed in the patent to
18 achieve a single capacitor with its two -- a single
19 equivalent capacitor with its two terminals that has
20 certain properties that would not be -- not
21 characterizing just a single capacitor in the finer
22 tuning and reducing the voltage across the variable
23 capacitor. That would be true for configurations A,
24 C, and D.

25 Q. All right. The '719 patent describes these

1 topologies as networks affixed in variable
2 capacitors; is that right?

3 A. That's right.

4 Q. But they would not fall under your
5 definition of "network of capacitors", as claimed in
6 Claim 17; is that right?

7 MR. LAWSON: Object to form.

8 THE WITNESS: Claim 17 has the phrase
9 "network of capacitors." You can put the whole
10 thing in quotes. And as we saw a couple of minutes
11 ago, a network of capacitors has a specific
12 definition that's defined in the specification as,
13 not in so many words, but essentially describing
14 connections of capacitors and/or inductors that have
15 multiple degrees of freedom in terms of adjusting
16 for impedance transformation.

17 By MR. PETERS:

18 Q. And it's your testimony that the topologies
19 in Figure 36 don't satisfy that definition of
20 "network of capacitors"; is that right?

21 A. That's right. Those topologies are just
22 other variations of the ones that I discussed
23 earlier in my declaration as being connections of
24 capacitors between two terminals that reduce to an
25 equivalent capacitance at the same two terminals,

1 and all of 36A through -D fall into that category
2 which I -- I believe elsewhere in the report, I
3 explain that in a network of capacitors, the
4 capacitors do not share voltage and/or current, but
5 that is what is happening in 36A through -D.

6 Q. Figure 36B illustrates two capacitors in
7 parallel; right?

8 A. That's correct.

9 Q. And that would be a form of a capacitor
10 bank?

11 A. That could be considered a trivial
12 capacitor bank, but usually a capacitor bank. The
13 term is "capacitor bank", as used in the trade,
14 typically in the context of the prior art references
15 that we've been discussing, each of the capacitors
16 is included or not included in the parallel
17 connection with the switch, so that the net result
18 is a variable capacitor.

19 In the case of 36B, one of the capacitors
20 is already variable, so you could call it a
21 capacitor bank or you couldn't, but it has the same
22 topology as what I would call a capacitor bank.

23 Q. Could you -- let's take a look at paragraph
24 40 of your declaration. Let me know when you're
25 ready.

1 A. Okay.

2 Q. In paragraph 40, you state in the middle
3 there, "Thus, in order to understand the full scope
4 of the claimed network of capacitors in Claim 17,
5 one must first understand the purpose and function
6 that such a network plays in the various embodiments
7 in Figures 30A through -F."

8 Do you see that?

9 A. Yes.

10 Q. Why Figures 30A through -F? And what I
11 mean, is why not Figure 30H? Why not Figures 31
12 through 36? Why just those?

13 A. There is the whole point of what I'm saying
14 in this paragraph. If you look at A through F,
15 those network of capacitors are comprised only of
16 capacitors. You start getting into H, I, J, K, L,
17 and M, now you have a variable inductor that's part
18 of the circuit.

19 So the circuits 30H through -M have the
20 same purpose and function as the circuits of A
21 through F, even though not every element -- not
22 every variable element is a capacitor. Some of the
23 variable elements are inductors. And that's what I
24 mean to say in paragraph 40.

25 Q. Your construction only requires one or more

1 capacitors; is that right? That's at the very
2 beginning of paragraph 40.

3 A. Well, if you look at some of the later
4 examples in, for example, 30H, there is only one
5 capacitor there. And in 30K, there is only one
6 capacitor. And 30M, there is only one capacitor.
7 The rest of the work is done by variable inductors.

8 When I say "capacitor", I mean variable
9 capacitor.

10 In 30 -- 30K, I think I just said that.
11 There is only one capacitor, but that circuit
12 performs the same function as one or more of the
13 circuits in 30A through -F that have only
14 capacitors.

15 Q. Okay. So is -- does Figure 30H illustrate
16 a network of capacitors?

17 A. Yes. As the network of capacitors --
18 extending the broadest meaning of "network of
19 capacitors" to all the circuits shown, it would
20 represent a, quote, "network of capacitors",
21 unquote.

22 Q. So in Figure 30H, the capacitor itself only
23 provides one degree of freedom and the variable
24 inductor provides another degree of freedom; is that
25 right?

1 A. That's right.

2 Q. So the capacitors don't have to provide
3 both degrees of freedom in a network of capacitors;
4 is that right?

5 A. Well, the variable inductor performs the
6 equivalent function of a variable capacitor. So
7 when I say "network of capacitors includes one or
8 more capacitors or their equivalent", I believe a
9 person of skill would understand that to include the
10 circuits of 30H through -M that also have variable
11 inductors.

12 Q. Right. And the actual capacitors shown in
13 Figure 30H is only providing one degree of freedom;
14 is that right?

15 A. In that particular circuit.

16 MR. LAWSON: Counsel, we've been going
17 about 55 minutes. I don't know if you're
18 getting into a new line of questioning, but if we
19 can take a break here in the next couple of
20 minutes.

21 MR. PETERS: Yeah. Let me just see if it's
22 a good stopping time or not. Hold on.

23 Yeah, it's a good stopping time. It is
24 12:35 in Eastern Time zone. Is it a good lunchtime
25 or should we do another session before lunch?

1 MR. LAWSON: I was thinking --

2 MR. PETERS: Sorry. Let's go off the
3 record.

4 MR. LAWSON: Yeah. We're going off the
5 record. It's fine.

6 MR. PETERS: Sorry about that.

7 COURT REPORTER: We're off the record.

8 (recess.)

9 COURT REPORTER: We're back on the
10 record.

11 By MR. PETERS:

12 Q. Welcome back, Dr. Horenstein. During the
13 break, did you speak to counsel about the substance
14 of your testimony?

15 A. No.

16 Q. All right. Let's go to -- pardon me.

17 All right. Let's go to Claim 17 of the
18 '719 patent. It's on the very last page. And let
19 me know when you're ready.

20 A. Okay.

21 Q. You see starting at line 13, there is
22 limitation for at least one of the resonators. It
23 "includes a coil of a plurality of turns of a
24 conducting material connected to a network of
25 capacitors."

1 Do you see that?

2 A. Yes.

3 Q. Do you see that Claim 17 recites a
4 system?

5 A. Yes.

6 Q. A resonator is a structure in a circuit; is
7 that right?

8 MR. LAWSON: Object to form.

9 THE WITNESS: I would think so.

10 By MR. PETERS:

11 Q. And a coil is a structure that's part of at
12 least one of the resonators; is that right?

13 A. Yes.

14 Q. And the network of capacitors is a
15 structure in this system as well?

16 MR. LAWSON: Object to form.

17 THE WITNESS: I would think so.

18 By MR. PETERS:

19 Q. Does the -- does Claim 17 recite a function
20 for the network of capacitors?

21 MR. LAWSON: Object to the form.

22 THE WITNESS: The claim just says "a
23 network of capacitors."

24 By MR. PETERS:

25 Q. Does it recite that the network of

1 capacitors must have at least one variable
2 capacitor?

3 MR. LAWSON: Object to the form.

4 THE WITNESS: Well, my -- my understanding
5 is that an inventor is free to be his own
6 lexicographer, and I do believe "network of
7 capacitors" is well defined as a structure in the
8 patent specification.

9 By MR. PETERS:

10 Q. And you're referring to the passage in
11 column 5 that you pointed out earlier?

12 A. Among others. That would be one passage.
13 I believe in my report I cite others that help
14 define "network of capacitors" in the context of the
15 patent.

16 Q. Well -- okay. Let's look at your
17 declaration then. Let's look at page 19, paragraph
18 38.

19 And just to be clear, you -- you do believe
20 that the inventor of the '719 patent acted as --
21 well, the inventors acted as their own
22 lexicographers?

23 MR. LAWSON: Object to the form.

24 THE WITNESS: In explaining what they mean
25 by -- or what they meant by "network of capacitors."

1 By MR. PETERS:

2 Q. Okay. And so in paragraph 38 of your
3 declaration, you state that the '719 specification
4 provides several examples of a network of
5 capacitors, but you don't state here that this
6 passage from column 5 is a definition. You describe
7 it as an example; is that right?

8 A. Well, I would suggest that passage that we
9 looked at before, that I cite in paragraph 39,
10 column 52, lines 32 to 38 of the '719, stands as the
11 intended definition of "network of capacitors."

12 Q. All right. Let's go off the record.

13 COURT REPORTER: Off the record.

14 (Break in proceedings.)

15 COURT REPORTER: We're back on the
16 record.

17 By MR. PETERS:

18 Q. Thank you for your time, Dr. Horenstein. I
19 have no further questions. I'll pass the witness.

20 MR. LAWSON: Thank you. At this time
21 Witricity doesn't have any -- any questions for the
22 witness.

23 MR. PETERS: Thank you so much.

24 COURT REPORTER: We're off the record.

25 (Proceedings concluded.)

1 CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC

2 I, BURGUNDY B. RYAN, Certified Reporter for the
3 State of California do hereby certify:

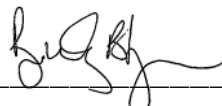
4 That MARK N. HORENSTEIN, Ph.D., the witness whose
5 deposition is hereinbefore set forth, was duly sworn
6 by me before the commencement of such deposition and
7 that such deposition was taken before me and is a true
8 record of the testimony given by such witness.

9 I further certify that the adverse party,
10 WITRICITY CORPORATION, was represented by counsel at
11 the deposition.

12 I further certify that the deposition of
13 MARK N. HORENSTEIN, Ph.D., was conducted virtually via
14 Zoom, commencing at 5:59 a.m. to 9:56 a.m.

15 I further certify that I am not related to
16 any of the parties to this action by blood or
17 marriage, I am not employed by or an attorney to any
18 of the parties to this action, and that I am in no way
19 interested, financially or otherwise, in the outcome
20 of this matter.

21 IN WITNESS WHEREOF, I have hereunto set my
22 hand this 15th day of August, 2024.

23
24 
25 _____

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