

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

3 -----
4 INDUCTEV, INC.,
5 Petitioner

6 vs

7 WITRICITY CORPORATION,
8 Patent Owner
9 -----

10 Case IPR2024-00140
11 U.S. Patent No. 8,466,654

12 Oral deposition of
13 MARK N. HORENSTEIN, Ph.D.

14
15 VIA VIDEO/TELECONFERENCE
16 TUESDAY, JANUARY 21, 2025
17 1:31 p.m. EASTERN TIME
18
19

20 Job No.: 567320

21 Pages: 1 - 104

22 Reported by: Lisa V. Feissner, RDR, CRR, CLR

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Oral deposition of MARK N. HORENSTEIN, Ph.D.,
held REMOTELY, via ZOOM, on TUESDAY, JANUARY 21,
2025 beginning at 1:31 p.m. pursuant to Notice,
before Lisa V. Feissner, RDR, CRR, CLR, Notary
Public.

1 A P P E A R A N C E S:

2 O N B E H A L F O F P E T I T I O N E R:

3 D A V I D A . Z U C K E R , E S Q U I R E
4 L A T H A M & W A T K I N S L L P
5 5 5 5 E l e v e n t h S t r e e t , N W , S u i t e 1 0 0 0
6 W a s h i n g t o n , D C 2 0 0 0 4
7 2 0 2 . 6 3 7 . 2 2 1 9
8 d a v i d . z u c k e r @ l w . c o m

9
10 O N B E H A L F O F P A T E N T O W N E R:

11 R Y A N M . C O R B E T T , E S Q U I R E
12 L A N C E A . L A W S O N , P . E . , E S Q U I R E
13 B U R R & F O R M A N L L P
14 1 0 1 S o u t h T r y o n S t r e e t , S u i t e 2 6 1 0
15 C h a r l o t t e , N C 2 8 2 8 0
16 7 0 4 . 3 4 7 . 6 4 7 5
17 r c o r b e t t @ b u r r . c o m
18 l l a w s o n @ b u r r . c o m

19
20 A L S O P R E S E N T:

21 K E L L I W E L C H , A / V T e c h n i c i a n
22 M I S H A H I L L , E S Q . , W i T r i c i t y C o r p o r a t i o n

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C O N T E N T S

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P R E V I O U S L Y
M A R K E D E X H I B I T S
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P R O C E E D I N G S

MARK N. HORENSTEIN, Ph.D.,

having been first duly sworn, was examined and
testified as follows:

EXAMINATION

BY MR. ZUCKER:

Q Good afternoon, Dr. Horenstein.

A Good afternoon.

Q As you heard a second ago, this is
technically a second deposition, so I hope you'll
bear with me for a minute as we go through the same
formalities we did this morning.

A Of course.

Q Would you state your name for the record,
please.

A Mark Nat Horenstein.

Q What is your address, Dr. Horenstein?

A 40 Hastings Street, West Roxbury,
Massachusetts, 02132.

Q Is that where you're located this
afternoon?

A Yes.

1 Q Is there anything that would prevent you
2 from testifying fully and truthfully today?

3 A No.

4 Q Is there anyone in the room with you
5 today?

6 A No.

7 Q Do you have any written or electronic
8 materials with you today relating to this case?

9 A No.

10 Q And you understand that you're not to
11 communicate with anyone else during the course of
12 this deposition other than through the Zoom,
13 correct?

14 A Yes.

15 Q What is your rate in this proceeding?

16 A It is \$325 per hour.

17 Q Is that what you receive or what the
18 litigation search firm bills you out at?

19 A That's what I receive.

20 Q Do you know what WiTricity pays the
21 litigation search firm for your the time?

22 A I do not.

1 Q You've prepared two declarations in this
2 particular case.

3 Is that correct?

4 A Yes.

5 Q Okay. Well, I suppose technically you've
6 prepared three, but one of them has been expunged.

7 Do you have any awareness of that?

8 A No.

9 Q We'll talk about the declarations just to
10 make sure we're on the same page.

11 MR. ZUCKER: Can we introduce
12 Exhibit 2001, please.

13 (Previously marked Exhibit 2001 presented
14 to the witness.)

15 BY MR. ZUCKER:

16 Q Dr. Horenstein, please let me know when
17 you can pull up Exhibit 2001.

18 A I have it.

19 Q Okay. Exhibit 2001 is the Declaration of
20 Mark N. Horenstein Regarding Certain Claim Terms
21 Found in U.S. Patent No. 8,466,654, correct?

22 A That's correct.

1 Q So just to we're on the same page today,
2 if we talk about the '654 patent, we're talking
3 about that patent, the patent at issue,
4 No. 8,466,654?

5 A That's right.

6 Q And this Exhibit 2001 is the first
7 declaration that you drafted in this proceeding
8 regarding the '654 patent, right?

9 A That's right.

10 Q Did you draft Exhibit 2001 yourself?

11 A Yes.

12 Q And had you -- strike that. Let me try
13 that again.

14 Do you stand by all of the opinions that
15 you expressed in Exhibit 2001?

16 A Yes.

17 Q Okay. No changes that you're aware of
18 that you want to make, anything like that?

19 A None that I am aware of at this time.

20 Q How much time did you spend preparing
21 Exhibit 2001?

22 A I don't recall.

1 Q More than five hours?

2 A I'm sure.

3 Q More than ten hours?

4 A Possibly. It was a year ago, so I don't
5 remember exactly.

6 MR. ZUCKER: So can we also introduce
7 Exhibit 2010, please.

8 (Previously marked Exhibit 2010 presented
9 to the witness.)

10 BY MR. ZUCKER:

11 Q Dr. Horenstein, please let me know when
12 you can see Exhibit 2010.

13 A I have it.

14 Q Okay. Exhibit 2010 is the Supplemental
15 Declaration of Mark N. Horenstein for a Petition for
16 Inter Partes Review of U.S. Patent No. 8,466,654,
17 right?

18 A Correct.

19 Q Do you recognize this Exhibit 2010?

20 A Yes.

21 Q And this is the second declaration that
22 you prepared as part of this '654 proceeding, right?

1 A Yes.

2 Q Did you draft Exhibit 2010 yourself?

3 A Yes.

4 Q Do you have any awareness of any other
5 declarations that you've prepared in this case other
6 than Exhibit 2001 and 2010?

7 A It's possible. I don't recall -- I don't
8 recall at the moment.

9 Q Okay. Did you do anything to prepare for
10 this deposition today?

11 A Yes.

12 Q What did you do to prepare?

13 A I read the -- these declarations; I read
14 the '654 patent, the various prior art references
15 that are discussed in my declaration; and I met with
16 counsel for WiTricity.

17 Q And when you say "these declarations,"
18 you're talking about Exhibit 2001 and Exhibit 2010?

19 A That's right.

20 Q Are there any other declarations that you
21 reviewed as part of your preparation?

22 A Like I said, there -- oh, that I reviewed

1 as part of my preparation? No.

2 Q Okay. Do you recall any other documents
3 that you specifically reviewed as part of your
4 preparation?

5 A I think if you look at the list of
6 materials considered, it could have been any and all
7 of the ones that are on page 3 of the supplemental
8 declaration, which is Exhibit 2010.

9 Q Did you review any documents other than
10 those that are cited and discussed in your
11 declarations?

12 A It's possible. I don't recall.

13 Q To the best of your recollection, are
14 there any documents you reviewed other than those
15 cited and discussed in your declarations?

16 A To the best of my recollection, there are
17 no other documents that I reviewed.

18 Q And just to be clear, today when we talk
19 about your declarations, we're limiting that to
20 Exhibit 2001 and Exhibit 2010, right?

21 A If you say so, okay.

22 Q I mean, you're not aware of any other

1 declarations relevant to this proceeding, right?

2 A Well, you referred earlier to a
3 declaration that was expunged, and I'm not sure I
4 have recollection of what that declaration was, why
5 it may have been expunged. I don't have -- I don't
6 recall at the moment.

7 Q Okay.

8 MR. ZUCKER: So let's introduce Exhibit
9 1001, please.

10 (Previously marked Exhibit 1001 presented
11 to the witness.)

12 BY MR. ZUCKER:

13 Q Dr. Horenstein, please let me know when
14 you can see Exhibit 1001.

15 A Okay, got it.

16 Q Exhibit 1001 is the '654 patent that is
17 the subject of this proceeding, right?

18 A That's right.

19 Q And I just want to make sure we're on the
20 same page about how this invention works.

21 Can you turn to Figure 4 of the '654
22 patent, please.

1 A If you'll give me one moment.

2 Okay, I have it.

3 Q Okay. The invention of the '654 patent
4 uses a primary coil and a secondary coil, correct?

5 A That's correct.

6 Q And in the '654 patent, the primary and
7 the secondary are magnetically coupled, correct?

8 A In the '654? That's correct.

9 Q Now, does the primary coil shown in
10 Figure 4 radiate waves?

11 MR. CORBETT: Objection to form.

12 A No. That would depend on the spacing D
13 shown in Figure 4.

14 Q Can you explain why the fact of radiation
15 would depend on the spacing?

16 A Yes. When current is flowing in an
17 oscillatory manner at a particular frequency in a
18 coil, there are three fields that are produced, the
19 local induction field, the near field, and the far
20 field, which is the radiating field.

21 And the value of D relative to the zone
22 of the near field is what determines whether the far

1 field will be able to radiate away from the
2 resonator.

3 Q But D is the distance between the primary
4 coil and the secondary coil, right?

5 A That's correct.

6 Q So is it your opinion that the question
7 as to whether or not the primary coil radiates waves
8 depends on the distance between the primary coil and
9 the secondary coil?

10 MR. CORBETT: Objection to form.

11 A Just to be clear, are you talking about
12 the arrangement in Figure 4 or the primary coil by
13 itself?

14 Q Well, let's start with the arrangement in
15 Figure 4.

16 A And are we assuming that the primary and
17 secondary coils are connected to their respective
18 corresponding circuitry?

19 Q Right. I think that's what's described
20 in the patent. So maybe we can take a step back.

21 So in Figure 4, the circuit is designed
22 such that the primary coil receives an AC current,

1 correct?

2 A Yes.

3 Q And so when the primary coil receives an
4 AC current, what happens?

5 A The current flows around the wire.

6 Q Does that generate some electromagnetic
7 energy emanating from the primary coil?

8 A It does.

9 Q Okay. Is that energy in the induction
10 field, the near field, the far field, or all of the
11 above?

12 MR. CORBETT: Objection.

13 A All of the above.

14 Q And so when a primary -- excuse me.

15 When an AC current flows through the
16 primary coil, energy emanates in the near field and
17 also in the far field, correct?

18 A Well, again, that depends. In Figure 4,
19 if D is too small, then it will intercept the far
20 field and absorb its energy as opposed to allowing
21 the far field to go off forever, to radiate off
22 forever. It will receive its radiation. That's why

1 it's called a receiving antenna, I believe, in the
2 patent.

3 Q Okay. So if there is not a secondary
4 coil, if there's just a primary coil that has
5 current flowing -- AC current -- strike that. Let
6 me try that again.

7 In the absence of a secondary coil, if a
8 primary coil has AC current flowing through it, will
9 it radiate energy?

10 MR. CORBETT: Objection to form.

11 A Yes. If the current is alternating
12 current at a high frequency, yes.

13 Q How high does the frequency have to be in
14 order for a primary coil with AC current flowing
15 through it to radiate energy?

16 A It depends on the diameter of the coil
17 and the thickness of the toroid shaped doughnut of
18 the coil.

19 Q Okay. And so if there is a secondary
20 coil present, it may be the case that the secondary
21 coil intercepts the energy emanating from the
22 primary coil before it reaches the far field,

1 correct?

2 A Well, no. The far-field component is
3 there. It radiates from the primary coil, but it
4 does not get very far. It's intercepted by the
5 secondary coil.

6 So it doesn't go off forever, which is
7 what would happen if the secondary coil were not
8 present.

9 Q Okay. So in Figure 4, there is a
10 far-field component that's radiated from the primary
11 coil, even when the secondary coil is present,
12 correct?

13 A The far-field component is produced at
14 the primary coil.

15 Q Is it true that whenever a conductor has
16 an alternating current running through it, a far
17 field component will be produced?

18 A No.

19 MR. CORBETT: Object to form.

20 Q What is an example of when a conductor
21 could have an alternating current running through it
22 that does not generate a far-field component?

1 A There is a benchmark equation that
2 determines whether or not there will be a far field.
3 I believe it's in my declaration. I can find it if
4 you want. But it relates to the general dimension
5 of the antenna versus the free space wavelength at
6 the frequency of excitation. I don't recall the
7 formula off the top of my head.

8 Q So is that to say that if the antenna is
9 too small, it may not generate a far-field
10 component?

11 A Rather the opposite. If it's too big, it
12 will not.

13 Q Okay. So it is possible that a primary
14 coil with an alternating current running through it
15 could be so large that it does not generate a
16 far-field component?

17 A Well, again, it depends on the frequency
18 of excitation.

19 Q In the absence of being so large, is it
20 true that a primary coil with alternating current
21 running through it generates near-field and
22 far-field components of an electromagnetic field?

1 MR. CORBETT: Objection to form.

2 A Again, it depends on the frequency of the
3 applied current and the overall dimension of the
4 antenna.

5 Q Okay. Do you generally agree with the
6 statement that passing AC current through a coil
7 results in radiating waves?

8 A I do not.

9 MR. CORBETT: Objection to form.

10 Q What part of that statement is incorrect?

11 A Well, two things. If the frequency is
12 low enough that it's below the radiation threshold
13 benchmark, then fields won't radiate.

14 And B, if the coil is part of the
15 magnetic circuit with a core inside, the core will
16 always contain the magnetic field, and there will be
17 no radiation.

18 Q And you're talking about a closed
19 magnetic circuit, correct?

20 A No.

21 Q Well, if it's an open magnetic circuit,
22 then some of the magnetic field will escape the core

1 and then there could be radiation, right?

2 A Generally not. Generally, the magnetic
3 field lines will seek their way back into the core
4 and will not radiate.

5 Q Doesn't that depend on how open the
6 magnetic circuit is?

7 MR. CORBETT: Objection to form.

8 (Reporter interruption.)

9 A Well, yes, to some extent, it does.

10 Q What we're really talking about is how
11 well coupled the components of the magnetic circuit
12 are, right?

13 MR. CORBETT: Objection to form.

14 A What do you mean by -- sorry.

15 It depends on what you mean by, the
16 components of the magnetic circuit.

17 Q Okay. We can come back to that later.

18 In Figure 4 of the '654 patent, the
19 primary coil is a loop antenna, correct?

20 A Presumably.

21 Q And the '654 patent says that a loop
22 antenna can have an air core, right?

1 A That's right.

2 Q So if this primary coil shown in Figure 4
3 is an air core loop antenna, and AC current passes
4 through the coil, it will radiate energy, correct?

5 A What frequency and what's the diameter of
6 the coil?

7 Q Well, did the '654 patent answer those
8 questions?

9 A It would be generally known to a person
10 skilled in the art what the magic formula is for the
11 beginning of generation of a far field. And again,
12 it depends on the free space wavelength at the
13 frequency of excitation and the general dimension of
14 the antenna. In this case, it would be the diameter
15 of the antenna.

16 Q Does the arrangement shown in Figure 4 of
17 the '654 patent satisfy what you call the magic
18 formula for the beginning of generation of a far
19 field?

20 A Well, it could. That's the point. If
21 you excited the primary at too low a frequency, it
22 wouldn't be able to radiate a far field. But it has

1 the capabilities of doing so if the frequency is
2 high enough. And therefore, that's what makes it an
3 antenna, not that it necessarily radiates a field,
4 but that it is capable of doing so. When I say
5 "field," sorry, I mean far field, that it's capable
6 of doing so.

7 Q I want to make sure I understand that.

8 So is it your opinion that being an
9 antenna does not require necessarily radiating a far
10 field but only requires that the device be capable
11 of radiating a far field?

12 A That's right.

13 Q Okay. If the primary coil of the '654
14 patent is a ferrite core loop antenna, is it capable
15 of radiating a far field?

16 A What do you mean by "a ferrite core"?
17 You have to be more specific.

18 Q Sure. The '654 patent describes loop
19 antennas with a physical core such as a ferrite
20 core, correct?

21 A It describes a ferrite core that fills
22 the air space of the primary coil.

1 Q Okay. And the primary coil of the '654
2 patent can have a ferrite core that fills the air
3 space of the primary coil and nonetheless radiate a
4 far field, correct?

5 A That's right. Because the ferrite core
6 is limited in thickness, roughly to the thickness of
7 the primary coil.

8 Q Okay. So let's look at your first
9 declaration, Exhibit 2001, paragraph 26. Let me
10 know when you've got that up.

11 A Okay.

12 Q Is it your opinion that a transmitting
13 antenna, as used in the '654 patent, means a primary
14 coil that produce a near-field component of flux
15 into free space that is intercepted by a secondary
16 coil to effect resonant inductive coupling?

17 A Are you asking me if I agree with that
18 statement?

19 Q I'm asking you whether that is still your
20 opinion that that's what the term means, yes.

21 A Yes.

22 Q Okay. Is that the general understanding

1 that a person of ordinary skill in the art would
2 have of the term "transmitting antenna," or is that
3 a definition that's specific to the '654 patent?

4 MR. CORBETT: Object to form.

5 A Neither of the above.

6 If we're talking about wireless power
7 transfer systems, then that would be a generally
8 accepted definition.

9 If we're talking about generally
10 transmitting antennas in the broad field of
11 electrical engineering, the broader interpretation
12 would be -- I'm sorry -- the interpretation of what
13 that means would be somewhat broader.

14 Q Okay. If a primary coil produces a
15 near-field component of flux into free space but it
16 is not intercepted by a secondary coil, would that
17 be a transmitting antenna as a person of ordinary
18 skill in the art would understand it?

19 A It produces a near-field component. If
20 there's no secondary coil to intercept it, that
21 field will collapse back into the primary antenna
22 every half-cycle of the excitation.

1 Q So is it your opinion that if there is no
2 secondary coil, that primary coil cannot be a
3 transmitting antenna?

4 A Well, again, it depends on the frequency
5 of the excitation and the overall dimensions of the
6 antenna, typically its diameter.

7 Q Well, I'm just trying to understand your
8 definition in Figure 26, which would seem to require
9 that a transmitting antenna produce a near-field
10 component that is intercepted by a secondary coil,
11 meaning it is a requirement to be a transmitting
12 antenna that the near-field component is, in fact,
13 received by a secondary coil.

14 And I'm wondering if that's true or if
15 I'm misunderstanding.

16 A First of all, minor correction. You said
17 Figure 26. I think you meant paragraph 26.

18 Q Thank you.

19 A And the first line of the sentence says,
20 Based on the '654 patent specification.

21 So one skilled in the art would
22 understand a transmitting antenna to mean it is in

1 the context of the '654 patent, which deals with
2 wireless power transfer.

3 And I do believe that the statement in
4 the following lines about what a transmitting
5 antenna would be understood to mean would be
6 generally accepted in this particular application of
7 the transmitting antenna.

8 Q So does this definition of "transmitting
9 antenna," as the term is used in the '654 patent,
10 encompass a primary coil that produces a near-field
11 component of flux into free space that is not
12 intercepted by a secondary coil?

13 A Yes.

14 Q So it is not a requirement of your given
15 definition of "transmitting antenna" to -- that the
16 near-field component be intercepted by a secondary
17 coil?

18 A Well, now, wait a minute. Look at the
19 third line, transmitting antenna as used in the
20 wireless power transfer context of the '654 patent,
21 which includes the existence of the secondary coil.

22 So to answer your question -- your

1 question was, what happens if there's no secondary
2 antenna. If there's no secondary antenna, you don't
3 have a wireless power transfer system; you just have
4 a coil that you're exciting at some frequency.

5 Q So I think we're getting close to this,
6 but I just want to be clear.

7 Is it your opinion that in the context of
8 the '654 patent specification, as used in wireless
9 power transfer, a primary coil in the absence of a
10 secondary coil cannot be a transmitting antenna?

11 A You have an inconsistency in your
12 question. You've asked me the question in the
13 context of a wireless power transfer system, and
14 then you're saying, oh, by the way, there's no
15 secondary, just the primary radiating field of, what
16 did you call it, an antenna.

17 It's a hypothetical that has no meaning
18 because if you didn't have the secondary, you would
19 not have the wireless power transfer system.

20 Q So the '654 patent describes a wireless
21 power transfer system, right?

22 A Yes.

1 Q And in one embodiment, at least, that the
2 primary coil is built into a parking spot or under
3 the ground of a parking spot, correct?

4 A Yes.

5 Q And the secondary coil is attached to a
6 vehicle, correct?

7 A Yes.

8 Q So is it your opinion that if the vehicle
9 is not currently present, the system ceases to be a
10 wireless power transfer system?

11 A It's a wireless power transfer system
12 when the car drives up, and it can transfer power.
13 If the car is not present, it's not transferring
14 power.

15 So it's kind of a hypothetical that is
16 semantic because, you know, if a tree falls in the
17 forest and no one hears it, does it make a noise?
18 There's no car there. When the car drives up, it
19 becomes a wireless power transfer system. If you
20 take the car away, is it still one? I think it
21 depends on who's going to be answering the question.

22 Q I'm asking you, from the perspective of a

1 person of ordinary skill, what the answer to that
2 question is.

3 A Well, in the context of what the antenna
4 does, you wouldn't be exciting the primary without
5 the secondary present.

6 Hypothetically, if you did excite the
7 primary at the relevant -- high enough frequency of
8 excitation, then it would radiate beyond the
9 near-field zone.

10 Q And in that scenario --

11 A When I say "it," I mean what I'm calling
12 the primary antenna.

13 Q Okay. And so if the primary antenna of
14 the '654 patent is excited at a high enough
15 frequency that it would radiate beyond the
16 near-field zone and there is not a secondary coil
17 around, does that primary antenna constitute a
18 transmitting antenna?

19 A Yes. And again, we're kind of taking it
20 out of the context of the system described in the
21 '654 patent. We're in the realm of general theory.
22 If I took this coil from the '654 patent and excited

1 it with no secondary coil, yes, it would radiate a
2 far-field component into free space if the frequency
3 of excitation was high enough.

4 Q Okay. And would that be the same answer,
5 for example, if the vehicle on which the secondary
6 coil was mounted was simply too far away to receive
7 the far-field component generated by the primary
8 antenna?

9 MR. CORBETT: Objection to form.

10 A Again, this is a very hypothetical
11 question. What do you mean by "too far away"? Have
12 I put it on a lift and taken it up to the ceiling of
13 the garage? Or is it out on the street? What do
14 you mean by not close enough or "too far away"?

15 Q Well, let's look, for example, at
16 Figure 5 of the '654 patent. All right?

17 A One minute. Sorry, did you say Figure 5?

18 Q Yes, Figure 5.

19 A Okay.

20 Q So Figure 5 of the '654 patent shows a
21 primary coil buried in soil that transmits energy to
22 a secondary coil mounted on a vehicle, correct?

1 A Yes.

2 Q Is the primary coil a transmitting
3 antenna?

4 A Well, if the two coils in Figure 5 have
5 the functional form of the two structures in
6 Figure 4, then yes, the primary coil would be a
7 transmitting antenna.

8 Q Okay. So if the primary coil is emitting
9 energy and the vehicle begins to drive away, is
10 there some point at which the primary coil will
11 cease to be considered a transmitting antenna?

12 MR. CORBETT: Objection to form.

13 A Not a fair question, because for the
14 system in Figure 5, if the vehicle drove away, the
15 primary coil would no longer be energized because
16 that's how the system is built.

17 Q I'm not asking whether it would or would
18 not stay on. I'm saying, assume that the primary
19 coil is energized. If the vehicle drives away, and
20 the secondary coil gets further and further away, is
21 there some point at which you believe, in the
22 context of the '654 patent, the primary coil would

1 no longer be considered a transmitting antenna?

2 MR. CORBETT: Objection to form.

3 A If the system keeps exciting the primary
4 coil with current at a high enough frequency, it
5 will be an antenna, and it will radiate.

6 Q Regardless of whether the secondary coil
7 is present or not?

8 A That's right.

9 Q Okay. So turning back to your
10 declaration in paragraph 26, your opinion is that a
11 receiving antenna means, in the context -- the
12 wireless power transfer context of the '654 patent,
13 a secondary coil that intercepts and receives a
14 near-field component of flux in free space that is
15 generated by a primary coil to effect resonant
16 coupling.

17 Is that correct?

18 A Yes.

19 Q So if there is a coil that intercepts and
20 receives a far-field component, does that meet your
21 definition of "receiving antenna," as that term is
22 used in the '654 patent?

1 A Well, again, the last sentence talks
2 about what a person skilled in the art would
3 understand about a receiving antenna and the
4 wireless power transfer context.

5 And it says in this definition that the
6 secondary coil intercepts and receives the
7 near-field component. It doesn't say it does not
8 intercept the far-field component, but what that
9 person would understand is that most of the energy
10 leaving the transmitting coil is contained in the
11 near field. The far field has much less energy in
12 that component of field.

13 So although the secondary would intercept
14 it, it wouldn't be providing much energy to the
15 secondary -- the circuit -- the load connected to
16 the secondary coil.

17 Q And so, for example, a couple of
18 paragraphs earlier, in paragraph 24, you talk about
19 Wi-Fi as being a communication standard that relies
20 on the far-field component for data transmission,
21 right?

22 A Right.

1 Q And so would a Wi-Fi receiving antenna
2 meet your definition of a receiving antenna as used
3 in the wireless power transfer context of the '654
4 patent?

5 A Well, it's another type of wireless power
6 transfer system that receives the far field and gets
7 its signal from the far field.

8 Q So does that fall within your definition
9 of a receiving antenna or not?

10 A Give me one second.

11 MR. CORBETT: Object to the form of the
12 pending question.

13 A If you would repeat the question, I would
14 appreciate it.

15 Q Does a Wi-Fi receiving antenna fall
16 within the definition that you've given in paragraph
17 26 of a receiving antenna or not?

18 MR. CORBETT: Objection to form.

19 A Well, paragraph 26 specifies that it's a
20 wireless power transfer system -- sorry, the word
21 system is missing -- wireless power transfer system
22 in the context of the '654 patent.

1 And the context of the '654 patent
2 involves vehicles. The title of the '654 patent is,
3 Wireless High Power Transfer Under Regulatory
4 Constraints.

5 So it's clear that the '654 patent
6 addresses wireless systems that are meant to
7 transfer a lot of power.

8 Now, Wi-Fi only has to transmit a signal.
9 The power of the signal is not important because the
10 receiver is extracting the information contained in
11 the modulation of the signal sent by the Wi-Fi
12 transmitter.

13 So that is why the Wi-Fi -- in the Wi-Fi
14 context, it's the far field that carries the
15 information. And that's consistent with what I say
16 in paragraph 24.

17 Q So does that mean that the Wi-Fi antenna
18 is or is not a receiving antenna under the
19 definition you provided?

20 MR. CORBETT: Objection to form.

21 A Well, kind of got it backwards. The
22 Wi-Fi is the transmitting antenna primarily, and

1 whatever is connected to the Wi-Fi, say the antenna
2 in your PC on your desk, that's the receiving
3 antenna.

4 Q Sure. There's a Wi-Fi adapter plugged
5 into the USB port of the PC on my desk, right?

6 A Okay.

7 Q And so my question is, would that
8 constitute a receiving antenna within the definition
9 that you've given in paragraph 26?

10 MR. CORBETT: Objection to form.

11 A Well, first of all, just to back up, I
12 think I misspoke because Wi-Fi communication is in
13 both directions between the data source and -- the
14 host and the receiver because the laptop, for
15 example, has to send data back to the Wi-Fi router.

16 Excuse me. My phone is making noise.

17 Excuse me.

18 I apologize for the interruption.

19 And again, paragraph 26 is talking about
20 antennas and their definitions in the context of the
21 '654 patent, which is about high power transfer.

22 Q So I think I still have my same question.

1 If you have a receiving antenna that only
2 receives energy in the far field and not in the near
3 field, does that preclude it from being a receiving
4 antenna under the definition you've given in
5 paragraph 26?

6 MR. CORBETT: Objection to form.

7 A Well, again, paragraph 26 applies to the
8 transmitting and receiving antennas in the context
9 of the '654 patent, which is about high power energy
10 transfer to a vehicle.

11 So the issue of where does the far field
12 fit into the definition of receiving antenna and
13 transmitting antenna in the '654 patent, well,
14 that's kind of moot because there's not very much
15 energy in the far field, so its contribution to the
16 transfer of power is minor compared to the
17 contribution of the near field.

18 Q Okay. Let's look at paragraph 27 of your
19 first declaration, Exhibit 2001.

20 A Okay.

21 Q It's an image of a transformer, correct?

22 A Yes.

1 Q Did you draw this yourself?

2 A I'm sorry, I was reading paragraph 27.

3 Are you talking about the figure that's
4 on page 12?

5 Q That's correct.

6 A Half and half.

7 Q What does that mean?

8 A Well, I found the form of the square
9 transformer core, it was either on the Internet or
10 some figures I had from previous documents that I
11 prepared. But I'm the one who added the windings
12 and the load and the power source and the labels.

13 Q Okay. So the form of this figure came
14 from somewhere else, but you're not sure where.

15 Is that correct?

16 A Well, this is a pretty standard shape,
17 and I could have drawn it myself easily in
18 PowerPoint. But to save time, I just took it from
19 whatever it was. But it's a very common shape. So
20 it's the one that I had in my head that I wanted to
21 use for this figure.

22 Does that answer your question?

1 Q It does. Thank you.

2 So there is a light green annotation on
3 the figure in paragraph 27, it says, Leakage Flux.

4 Do you see that?

5 A Yes.

6 Q Leakage flux is flux that's generated by
7 the primary coil that escapes the core of a
8 transformer, right?

9 A Well, what do you mean by "escapes"?

10 Q Well, that's the word that you use in
11 this paragraph, right?

12 A Okay. What that means is, it's not
13 contained in the core, but it circulates around
14 itself. The magnetic flux lines still circulate,
15 start at a point and end at a point.

16 Q So can we agree that the leakage flux
17 that's shown here is some flux that has escaped the
18 core?

19 A Well, part of it's in the core, and part
20 of it's out of the core. Otherwise, it wouldn't be
21 leakage flux.

22 In other words, the part of the light

1 green line labeled Leakage Flux that's kind of on
2 the right side of the oval, that's in the core and
3 inside the windings, the red colored windings.

4 But it doesn't stay coupled to the core;
5 it goes into the air. But it still circulates
6 around just like the magnetic flux inside the core.

7 Q And I think you answered this in the last
8 question. But when that leakage flux or some of it
9 escapes the core, it's then in the air around the
10 core, correct?

11 A It's been in the air. Let's say that its
12 pathway takes it through the air outside of the
13 core.

14 Q As a practical matter, all real world
15 transformers will have at least some leakage flux,
16 correct?

17 MR. CORBETT: Object to form.

18 A As a practical matter, transformers are
19 designed to have a minimal amount of leakage flux.
20 But you're correct, there will always be some there,
21 no matter how small. The ideal situation would be
22 zero leakage flux.

1 Q As a practical matter, any device that
2 generates magnetic flux is going to generate some
3 leakage flux, correct?

4 A No.

5 Q Can you give me an example of a device
6 that generates magnetic flux without any leakage
7 flux?

8 A Well, yeah. The antennas in the '654
9 patent, because there's no core out of which the
10 flux can leak. You can't have something leaking out
11 of a core if you don't have a core.

12 So if you change your question to devices
13 that have a magnetic core, then yes, there will
14 generally be leakage flux.

15 Q Thank you. So let me ask that again,
16 then.

17 As a practical matter, any device that
18 has a magnetic core is going to generate some
19 leakage flux, correct?

20 A Well, the current circulating around the
21 core will produce a small amount of flux that goes
22 outside the core and then comes back into the core,

1 circulates around.

2 Q So in your figure, you drew an oval of
3 leakage flux only in one portion around the core.

4 Do you see that?

5 A Sure.

6 Q But in reality, the leakage flux is going
7 to be all around the core, right? It wouldn't be
8 limited to the area you've circled in this oval.

9 A No, that's not true.

10 Q Why -- where -- let me try that again.

11 Where in this figure would leakage flux
12 occur?

13 A It's confined to the region where the
14 wire is wound around the core because it's produced
15 by the current flowing through the windings. So it
16 would be confined to the -- roughly to the region
17 where I have drawn it in the figure we're talking
18 about.

19 Q Well, it circulates -- strike that.

20 The leakage flux that escapes the core
21 here is going to be in the air around the core in
22 all directions, not as you've drawn it, sort of only

1 to the left, correct?

2 A What do you mean by "all directions"?

3 Q So the portion of the core that you've
4 shown surrounded by red coil has four sides,
5 correct?

6 A The coil has four sides that are -- the
7 whole core has four sides because it's a square.
8 But you're talking about just the left-hand post has
9 four sides.

10 Q Correct. The left-hand post of the core
11 has four sides, correct?

12 A Yes.

13 Q Is it correct that the leakage flux will
14 be on all four sides of the left-hand post?

15 A Not really.

16 Q Why is that?

17 A If you look at the inner surface of what
18 we're calling the post, sort of the right-hand side
19 of where the red windings are, you know, that --
20 it's surrounded by the two horizontal pieces of the
21 core, which would intercept what would otherwise be
22 the leakage flux.

1 So the leakage flux doesn't circulate
2 around through the air like the one on -- like the
3 flux lines that are indicated in green on the left
4 of that post.

5 Q Do the other two faces of the left hand
6 posts have leakage flux surrounding them?

7 A Yeah, probably.

8 Q Okay.

9 A Sorry. Just to be exact, you said,
10 leakage flux surrounding them. The leakage flux
11 does not surrounding the core. The leakage flux
12 goes in and out of the winding at the surface of the
13 core, but not around the core.

14 But I think what you're trying to say is,
15 if I drew -- if I looked around three sides of the
16 core, not including the inner surface, would there
17 be leakage flux on those surfaces, and the answer is
18 yes.

19 Q Right. If you were to look at the three
20 sides of the left-hand post of your drawing --

21 A Yes.

22 Q -- there would be leakage flux in the air

1 in the vicinity of the core, correct?

2 A That's right.

3 Q You're familiar with the concept of an
4 E-shaped core?

5 A Yes.

6 Q If you had an E-shaped ferrite core with
7 a coil wrapped around the middle protrusion --

8 A Yes.

9 Q -- and you ran an AC current through it,
10 would it radiate radio waves?

11 A No.

12 MR. CORBETT: Objection to form.

13 Q Are you saying it absolutely could not,
14 or it would depend on the circumstances?

15 A Well, theoretically, if you energize it
16 in the gigahertz, it could radiate, but then it
17 wouldn't -- then the presence of the core would be
18 irrelevant because the frequency would be too high,
19 and you'd get a large amount of eddy current. So as
20 a practical matter, the frequencies at which you can
21 excite the E-core would not radiate.

22 Q Doesn't that depend on the size and shape

1 of the core and the coil?

2 A Not really, no. If it looks like --
3 you're saying it looks like the letter E.

4 Q Right.

5 A As we understand what a capital E looks
6 like but turned on its side. That's what we mean by
7 an E-shaped core -- cross-section having an E-shaped
8 core.

9 Q That's correct.

10 A So for those general dimensions, no, the
11 field would not radiate.

12 Q Could not radiate no matter what?

13 MR. CORBETT: Objection to form.

14 A For the most part, it would not radiate.

15 Q Okay. So it could or would slightly
16 radiate. Isn't that what "for the most part" means?

17 A Well, I gave you scenarios where it might
18 radiate if I excited the coil in the gigahertz or
19 above, but then I would get so much eddy current
20 loss in the core that all the energy would be
21 dissipated anyway. So, you know, I would say that's
22 a no, it won't radiate under any practical

1 conditions.

2 (Reporter interruption.)

3 Q So in the following paragraph of your
4 Exhibit 2001 declaration, paragraph 28, you show
5 what you call an air gap transformer.

6 Do you see that?

7 A Yes.

8 Q And you say, the flux lines follow the
9 path of least resistance.

10 Do you see that?

11 A I see the figure. Where do I say they
12 follow the path of least resistance?

13 Q The second sentence of paragraph 28.

14 A Least resistance in quotes. Yeah, it
15 says that.

16 Q Okay. What are you quoting there?

17 A Well, you know, the actual word should be
18 reluctance, but it's meant as a more generic term
19 that the flux lines will take the easiest pathway
20 around the core.

21 I could have gotten into the details of
22 the permeability of the core and how that affects

1 the reluctance of the air gap versus the core and
2 put in a whole bunch of equations, but I didn't
3 think it was relevant.

4 So I just said -- the least resistance in
5 quotes is meant to mean the easiest pathway. It's
6 sort of what often we refer to as bunny ears quotes.
7 But it's not quoting a source.

8 Q Okay. And so in your figure, you talk
9 about flux lines crossing the air gap in a
10 transformer, correct?

11 A Yes.

12 Q As a practical matter, under real world
13 constraints, not 100 percent of the flux will cross
14 that gap, right?

15 MR. CORBETT: Objection to form.

16 A Yeah, it would.

17 Q Your position is that under real world
18 constraints, absolutely 100 percent of flux
19 successfully navigates that gap and remains in the
20 core?

21 A It's --

22 MR. CORBETT: Objection to form.

1 You can answer.

2 A It's not me; it's Gauss's law of
3 electromagnetics that says that all the flux has to
4 cross the gap because the magnetic flux has zero
5 divergence, according to Maxwell's equations.

6 Q So if I took the figure that you have
7 here in Figure 28 and pulled the right-hand side
8 further away so the air gap was ten times as large,
9 your position is that still absolutely 100 percent
10 of the flux would bridge that gap and remain in the
11 core?

12 MR. CORBETT: Object to form.

13 A So you're talking about a scenario that
14 doesn't look like my picture, so let me talk about
15 that.

16 As you pull, say, the right-hand side of
17 the core further to the right, once the gap becomes
18 comparable to the vertical distance between the top
19 leg of the square core and the bottom leg, some of
20 the field lines, instead of going through the
21 right-hand core will circle around back into the
22 left-hand core and the flux will be divided.

1 If you took the right-hand side
2 completely away, then all the flux lines would
3 circulate around through the air and go back into
4 the lower part of the core.

5 Q If you took the right-hand side of the
6 figure in 28 completely away and ran an AC current
7 through the red coil, would it radiate energy?

8 A No.

9 Q Not at all or to negligible amounts?

10 A Not at all.

11 Q Why is that?

12 A Because all you've -- all you're
13 producing -- because you've got a core around which
14 your coil is wrapped, you're only producing the
15 induction field. You're not producing a near field
16 or a far-field, only what we call the induction
17 field, which is what is produced by a magnetic
18 circuit. Magnetic circuit means -- the only
19 magnetic field is the induction field.

20 Q The presence of a ferrite core doesn't
21 necessarily mean the complete absence of a
22 near-field or far-field component, does it?

1 MR. CORBETT: Objection to form.

2 A Can you clarify that question?

3 Q It is possible to have a coil wrapped
4 around a ferrite core that nonetheless, when AC
5 current flows through the coil, generates near-field
6 and far-field components, correct?

7 MR. CORBETT: Objection to form.

8 A I think you're talking about the ferrite
9 core that's briefly discussed in the '654 patent,
10 and that's more like a ferrite disk rather than a
11 core around which a complete primary or secondary
12 winding is wound.

13 So if the core is small enough and
14 confined to just a small region of the primary coil,
15 then there will be a near field and possibly a far
16 field.

17 Q Okay. And so just so we're agreeing, in
18 agreement, it is possible to have a coil wrapped
19 around a ferrite core that then produces a
20 near-field and a far-field component when AC current
21 runs through the coil. Agreed?

22 MR. CORBETT: Objection to form.

1 A Yes, but that wouldn't be a magnetic
2 circuit or anything close to a transformer.

3 Q Okay.

4 A So, you know, again, it's a nitpicky
5 hypothetical that will produce a nice sound bite,
6 but no, it will radiate, but it's not a transformer
7 core.

8 Q Well, to be clear, that's what's
9 described in the '654 patent, right, a coil wrapped
10 around a ferrite core that nonetheless radiates and
11 produce a near-field and far-field component?

12 MR. CORBETT: Objection.

13 A Yes, that core has a very specific
14 purpose in the '654 patent, and it is not to contain
15 the flux.

16 Q Right. Okay.

17 MR. ZUCKER: Can we introduce
18 Exhibit 2006, please.

19 MR. CORBETT: We've been going about an
20 hour. I don't know if now is a good breaking point.

21 MR. ZUCKER: Yeah. Why don't we do that.
22 That's a good time.

1 (Recess from 2:30 p.m. until 2:40 p.m.)

2 (Previously marked Exhibit 2006 presented
3 to the witness.)

4 BY MR. ZUCKER:

5 Q Dr. Horenstein, did you speak to anyone
6 during the break?

7 A No.

8 Q Right before the break, we introduced
9 Exhibit 2006.

10 Are you able to pull that up?

11 A Yes.

12 Q Okay. Do you recognize Exhibit 2006 as
13 the Wiley Electrical and Electronics Engineering
14 Dictionary?

15 A Yes.

16 Q This is a dictionary that you relied on
17 to form some of your opinions in this case, correct?

18 A More like to confirm my opinions. I had
19 the opinions before I consulted the Wiley
20 dictionary.

21 Q Sure. So if you turn to page 3, there is
22 a definition of far-field region.

1 Do you see that?

2 A Yeah.

3 Q Do you agree that a person of ordinary --
4 let me try that again.

5 Would a person of ordinary sill agree
6 with this definition of far-field region in the
7 context of the '654 patent?

8 A Yes.

9 Q And the last sentence says, the region of
10 space closer to the antenna than the far field is
11 the near-field region.

12 Do you see that?

13 A Yes.

14 Q Do you agree that the region of space
15 closer to the antenna than the far field is the
16 near-field region?

17 A Yes.

18 Q If we look at page 6 of this document,
19 there's a definition of near-field region.

20 Do you see that?

21 A Yes.

22 Q And it defines the near-field region as,

1 For a transmitting antenna, the electromagnetic
2 field extending no further than a distance of $2D$
3 squared over λ where D is the maximum overall
4 dimension of said antenna, and λ is the
5 wavelength considered. Beyond this distance, the
6 far-field region begins.

7 Do you agree with that definition?

8 A Yes.

9 Q And so this is saying that the area that
10 is more than $2D$ squared over λ away from the
11 antenna is the far field, and the area that is
12 closer than $2D$ squared over λ to the antenna is
13 the near field, correct?

14 A Yeah, more or less. It's not like a step
15 function boundary. Generally, those -- that
16 equation, which is the one I was trying to think of
17 before, $2D$ squared over λ , that generally
18 describes the transition from the near field to the
19 far field.

20 Q Are you saying that in your opinion
21 there's not a hard boundary between the near field
22 and the far field?

1 A There is not a hard boundary. There's --
2 it's going to depend on the structure of the
3 antenna. And it's not like all of a sudden there's
4 a near field and then it goes to zero. The term is
5 evanescence. So the midpoint of the evanescent
6 decay of the near field would occur at about $2D$
7 squared over λ .

8 Q Okay. And so is it possible that there
9 is physical overlap between the area of the far
10 field and the area of the near field?

11 MR. CORBETT: Object to form.

12 A Not really.

13 Q So maybe I misunderstood what you're
14 suggesting when you say that there's not a hard
15 boundary.

16 How are you defining the distinction
17 between the near field and the far field?

18 A Well, the far-field region is where the
19 energy will propagate away from the antenna and go
20 off on its own. In the absence of being intercepted
21 by something, it will go on forever to infinite
22 distances before it peters out, and the near field

1 will collapse back into the antenna.

2 So, you know, it's -- it's kind of like
3 if you're going from the top of a mountain on a
4 plateau to a flat valley down below, what do you
5 call in between? It's kind of the transition in
6 between. It's not like there's a hard boundary
7 between the upper surface and the lower surface.
8 That's a good analogy to the transition from near
9 field to far field.

10 Q So is there some region in between where
11 a person of ordinary skill in the art could
12 reasonably dispute whether it's in the near field or
13 the far field?

14 MR. CORBETT: Object to form.

15 A Not really. The $2D \text{ squared over } \lambda$
16 is generally accepted as the metric for whether you
17 consider yourself in the near field or the far
18 field, meaning that inside that dimension, the
19 near-field component has got a higher field
20 intensity than what will go on to be the far-field
21 component.

22 Q So it is possible that there is a

1 far-field component within a distance of less than
2 $2D$ squared over λ ; it's just dominated by the
3 near-field component?

4 A Complicated question for me to answer,
5 because your question implies that these components
6 are discrete orthogonal entities that can exist
7 separately on their own.

8 The transmitter produces an oscillating
9 field, and you talk about the near field and the far
10 field in terms of the energy that they carry.

11 So when you say there's a component of
12 the far field in the near field, I would answer that
13 question by saying, some of the energy that is
14 destined to be contained within the far field is
15 going to be present with the energy that constitutes
16 the near field, which is going to collapse back into
17 the antenna.

18 But I would describe that -- the mixture
19 of components in terms of the energy contained
20 within the field and not field lines themselves.

21 Q Okay. So let's look at your
22 Exhibit 2010, paragraph 37. Let me know when you've

1 got that up.

2 A Okay.

3 Q There's a graphic in paragraph 37 of your
4 Exhibit 2010, correct?

5 A That's right.

6 Q You don't cite anything as the source of
7 that graphic, correct?

8 A Well, no.

9 Q Where in paragraph 37 is there a citation
10 to a source of that graphic?

11 A One does not normally cite one's self
12 when one is making a figure.

13 Q Okay. So you drew this graphic yourself
14 from scratch?

15 A That's right.

16 Q Okay. It didn't -- we talked earlier
17 about a graphic that you had pulled some portions or
18 form of from some other website or textbook.

19 Is that the case for the graphic in
20 Figure 37?

21 A No.

22 I mean, just to be clear about the former

1 case of the transformer, you're implying that I got
2 the idea of the core from some other source. That's
3 like picking a font out of a font collection and
4 putting it on your document. I mean, that form is
5 well-known.

6 Here, I tried to depict the three
7 different regions based on their relationship to the
8 antenna loop, and I drew this picture myself to
9 indicate -- to the best of my ability to convey the
10 idea what's going on with the three different
11 fields.

12 Q In the diagram that you've drawn in
13 Figure 37, there is overlap between the local or
14 induction field and the near field, correct?

15 A I wouldn't take it too seriously. This
16 is an artist's conception and depiction of generally
17 where the fields exist. But you're implying that
18 there's an -- oh, gosh, there's an overlap between
19 the near field and the induction field. It's just
20 the way I drew it to generally show where the fields
21 and their energy will exist.

22 So I really can't answer your question.

1 You're saying there's an overlap. If you say so. I
2 don't think it's relevant.

3 Q In an energized loop antenna, is there
4 overlap between the area where the local induction
5 field exists and the area where the near field
6 exists?

7 A Well, again, you know, it's not a sharp
8 boundary. It all has to do with the energy content
9 of the relevant fields. And it's more like a
10 benchmark distance. It's not like a demarcated
11 boundary where, oh, the fields can't overlap from
12 one region to another.

13 It's generally where is the predominant
14 energy in the near field. It's associated with
15 those blue arcs that I drew, and the arrows indicate
16 that that field collapses back into the antenna.

17 And where is the energy contained in the
18 far field? Well, that's over there on the right
19 with the arrows that only point to the right,
20 indicating that the radiation is propagating away
21 from the antenna.

22 Now, the problem is, you're assuming that

1 these lines represent the actual electromagnetic
2 fields. And the problem with that is, we cannot see
3 electromagnetic fields. We can actually see light,
4 which is a form of electromagnetic field, but we
5 can't see the field lines.

6 So I'm just drawing an artist's
7 conception of what the equations predict for the
8 near field and the far field zones. And that's it.
9 I would not draw any distinct information about this
10 figure other than that it's an artist's conception
11 indicating the three regions of field.

12 I hope that answers your question.

13 Q It does in part. I'd like to ask further
14 about something you raised in there.

15 So do you agree that there is not a hard
16 boundary between the local induction field and the
17 near field?

18 MR. CORBETT: Objection to form.

19 A There is a distinction in that any field
20 lines that circulate around the antenna loop are --
21 do comprise the local induction field. And any
22 field lines that go away from the antenna and come

1 back and collapse in the antenna and then go off the
2 other way to the left -- sorry, I lost my train of
3 thought.

4 What was your question again?

5 Q What I'm asking is, is there going to be
6 some physical point shortly outside of the antenna
7 where there is both energy in the near field and
8 energy in the induction field, or are those two
9 things mutually exclusive at any physical point in
10 space?

11 A There's always energy in both of them.
12 The field lines of the induction field are
13 associated with field lines that wrap around the
14 conductor, and the field lines associated with the
15 near field are associated with field lines that go
16 away from the conductor but then the energy comes
17 back into the conductor.

18 So I think you can surmise that the near
19 field energy has to pass through the region of the
20 local induction field in order to get some distance
21 away from the antenna loop.

22 And the same can be said from the far

1 field. The near field will -- you know, part of the
2 near field becomes the energy of the far field, and
3 the remainder of the energy stays in the near field
4 and collapses back into the antenna loop.

5 And meanwhile, the energy associated with
6 the local induction field, well, that just stays
7 local to the loop carrying the current and doesn't
8 go anywhere. It's very, very local and stays where
9 it is produced.

10 Q And so there will be points in space
11 where there are both field lines of the induction
12 field and also field lines associated with the near
13 field?

14 A No. Like I said before, you have to talk
15 about it in terms of the energy content. The field
16 lines will always be themselves. You can't have --
17 unless you had another source somewhere, which you
18 don't, you can't superimpose field lines one on the
19 other.

20 These are all field lines that are
21 produced by the antenna loop, and some of the energy
22 goes into the far field, some of the energy goes

1 into the near field, and some stays with the
2 induction field.

3 Q You said a minute ago that the near field
4 energy has to pass through the region of the local
5 induction field, correct?

6 A Yes.

7 Q So there is some point outside the
8 antenna at which there will be both induction field
9 energy and near field energy, right?

10 A Well, energy, yes; field lines, no.

11 Q Okay. How do you determine the boundary
12 between the local induction field and the near
13 field?

14 A You don't.

15 Q Okay. Let's talk --

16 A You just know that if you go an
17 appreciable distance away from the antenna and
18 you're measuring some field, you are measuring the
19 near field energy.

20 The local induction field -- going back
21 to our previous depo, I'm sorry to bring it up. The
22 local field -- the local induction field decays as 1

1 over R cubed from the source, the near field as 1
2 over R, and the far field as 1 over R squared.
3 That's how the energy decays.

4 So where are you transitioning from one
5 region to the other? It's sort of more of a general
6 concept of where the energy lies as it's being
7 produced by the antenna loop.

8 But look, there's no way that the local
9 induction field is going to radiate or contribute to
10 that loop. Something that produces a local
11 induction field and can't produce a near field and a
12 far field is not going to be an antenna.

13 Q Okay. So if I -- if we pointed to a
14 particular point in space outside of an energized
15 loop antenna and said, is this within the induction
16 field or the near field, is that a determination
17 that you would be able to make somehow, or is it not
18 knowable?

19 A It's -- it's contained within the
20 equations that describe the field lines. And if I
21 took something that could measure field strength and
22 went around the coil, you know, could I find the

1 boundaries between these three regions? No.

2 Q Okay.

3 MR. ZUCKER: Can we introduce Exhibit
4 1005, please.

5 (Previously marked Exhibit 1005 presented
6 to the witness.)

7 BY MR. ZUCKER:

8 Q Dr. Horenstein, please let me know when
9 you can see Exhibit 1005.

10 A Okay, I've got it.

11 Q Exhibit 1005 is the Odachi prior art
12 reference, correct?

13 A Yes.

14 Q Did you review Odachi as part of your
15 preparation and writing your declarations in this
16 case?

17 A Yes.

18 Q I'd like to just make sure we're on the
19 same page about how Odachi works, and the easiest
20 way to do that might be with reference to Figure 11,
21 if you can pull that up.

22 A Okay.

1 Q Item 230 of Odachi is the primary
2 coupler, correct?

3 A It's -- if it's called the primary
4 coupler, it has various pieces to it. But if you're
5 telling me that 230 is called the primary coupler,
6 I'll accept that.

7 Q And the primary coupler has a core 31 and
8 a coil 32, correct?

9 A It's really hard to discern what's what
10 in Figure 11. I believe it's better represented in
11 Figure 12.

12 Q Well, if you want to see those specific
13 numbers, I can point you to column 8, lines 40
14 through 48 of Odachi.

15 A Well, the numbers are in Figure 12, so no
16 need.

17 Q Okay. So can we agree that Odachi has a
18 primary coupler 230 that consists of core 31 and
19 coil 32?

20 A Correct.

21 Q And Odachi has a second coupler, that's
22 item number 2, right? Excuse me.

1 Odachi has a secondary coupler, item
2 number 2, correct?

3 A Right.

4 Q And the secondary coupler consists of
5 core 3 and coil 4?

6 A Yes.

7 Q Now, Figure 11 shows the primary coupler
8 in its rightmost position with an arrow noting that
9 the primary coupler will be moved to the left,
10 correct?

11 A It's not clear whether it's at the
12 furthest distance away from the secondary it can be.
13 It is confusing, because from the driver's point of
14 view, the 230 structure is on the left, but from the
15 point of view of this picture, it's on the right.

16 So we'll go by the picture orientation
17 with 43D being on the right of the center of the
18 car.

19 Q Okay. So just so we're clear, the way
20 Odachi's positioning system works is that the
21 primary coupler on support arm 43D moves from right
22 to left across Figure 11, right?

1 A Yes.

2 Q And starting when the primary coupler is
3 in its rightmost position, Odachi applies an AC
4 check current to the primary coil, correct?

5 A Yes.

6 Q So when the check current begins to flow
7 and Odachi's primary coupler is in its rightmost
8 position, the primary coupler is not in contact with
9 the secondary coupler. Agreed?

10 A Not in the rightmost position.

11 Q And so the primary coupler is then moved
12 right to left the entire length of the figure shown
13 here, and during that entire time, the primary
14 coupler is not in contact with the secondary
15 coupler, right?

16 A That's right.

17 Q Okay. And at some point during that
18 right-to-left sweep, Odachi's primary coil will
19 induce a voltage in the secondary coil, right?

20 A That's right.

21 Q And at that time, there will be a
22 distance between the primary coupler and the

1 secondary coupler, right?

2 A Distance in what direction?

3 Q There will be a distance at least in the
4 Z direction, correct?

5 A Well, by "Z direction," you mean
6 perpendicular to the page?

7 Q Correct. The distance from the underside
8 of the car to the ground.

9 A There will be a space between the primary
10 coupler and the secondary coupler.

11 Q Okay. And so as Odachi's primary coupler
12 moves leftward across Figure 11, there is some point
13 in time which will be the first point in time at
14 which it induces a voltage in the secondary coupler,
15 right?

16 A It's more like a gradual transition to
17 the maximum induction value. It's not like it's a
18 hard boundary.

19 Q Sure. And when that gradual transition
20 starts, there will also be in the X direction a
21 distance between the primary coupler and the
22 secondary coupler, right?

1 A That's right.

2 Q And depending on how the car is parked,
3 there may or may not also be a transition in the --
4 strike that.

5 Depending on how Odachi's car is parked,
6 there may or may not also be a distance between the
7 primary coupler and the secondary coupler in the Y
8 direction as a voltage is induced in the secondary
9 coupler, correct?

10 A Are you talking about a displacement as
11 opposed to a distance?

12 Q Well, the car, as shown in Figure 11,
13 could be parked a little further away from the end
14 unit, right?

15 A It could be.

16 Q And in that case, there would be a
17 distance in the Y direction between the primary
18 coupler and the secondary coupler of Odachi, right?

19 A The two Y axes would not be aligned in
20 the X direction, where the Y axes are defined at the
21 center of each of the primary and secondary coils.

22 Q So when the check current first begins to

1 flow through Odachi's primary coil, it generates an
2 electromagnetic field, correct?

3 A Yes.

4 Q At the point where current first begins
5 to flow through Odachi's primary coil, is it tightly
6 coupled to the secondary coil?

7 MR. CORBETT: Objection to form.

8 A No.

9 Q When current first begins to flow through
10 Odachi's primary coil, is Odachi's secondary coil in
11 the far-field region of the transmitter?

12 A Kind of irrelevant because there's no
13 radiation coming out of Odachi's primary core
14 structure.

15 Q So is that a yes or a no?

16 A It's an irrelevant question.

17 Q I appreciate that. But as I'm sure your
18 counsel can explain, you need to answer the
19 questions that I ask today, whether you believe
20 they're relevant or not.

21 A Well, you're asking me if the secondary
22 is in the far-field region, and there is no

1 far-field region at all. So I don't know how to
2 answer your question.

3 Q Okay.

4 A I'm simply pointing out that it's a
5 question that can't be answered.

6 Q And your basis for saying there is no
7 far-field region is because you believe Odachi's
8 coupler does not create radiation, right?

9 A It does not create radiation.

10 Q And that statement is based on the shape
11 of Odachi's primary core?

12 A The core and the dimensions indicated in
13 Figure 12 and the description of that E-core in the
14 specification.

15 Q Well, is there a part of Odachi that says
16 it doesn't radiate?

17 A Doesn't have to say it doesn't radiate
18 because it doesn't radiate. Why would you say it
19 doesn't radiate if there's no way it can?

20 Q Well, I asked you what parts of Odachi
21 you referenced, and you said there is a statement or
22 a description that says it doesn't radiate. And I'm

1 asking whether that's true or not.

2 A I didn't say what you just said. It
3 misstates what I said.

4 Q Okay. So what is it about Odachi that
5 you're relying on for your opinion that the primary
6 coupler doesn't radiate energy?

7 A Because it's a magnetized -- it's an
8 E-core with a coil around it, and the field lines
9 are going to go from the center of the E and then
10 outward to the two sides of the E.

11 Q When you say, outwards to the two sides
12 of the E, can you help me understand what that
13 means?

14 A Well, the flux is going to come out of
15 the center section, and it's going to split into two
16 pieces. Some of the field lines will go left, and
17 some will go right.

18 Q So is it your opinion that no flux
19 escapes the core of Odachi's primary coupler?

20 A That's correct.

21 Q Okay.

22 A Well, I mean, there will be flux in the

1 space between the three vertical sections of the E,
2 but they will return to the core. And if they go
3 out of the core, they'll return to the core.

4 Q And there will be also -- also be leakage
5 flux around the air outside the core, correct?

6 A Well, you know, the leakage flux is going
7 to be locally confined to the primary winding. So
8 it's not -- it's going to be around the air kind of
9 in the lower channels of the E, if you will.
10 Leakage flux is not going to reach the outer
11 portions of the E.

12 Q Let's take a look at Odachi's Figure 5.
13 The x-axis of Figure 5 shows the X position of the
14 primary coupler during its right-to-left sweep,
15 correct?

16 A Right, correct.

17 Q And the y-axis of Figure 5 shows the
18 induced voltage in the secondary coupler at that
19 particular x-axis position?

20 A I think that's true. Just one second.
21 That's correct.

22 Q So in Odachi's Figure 5, X1 is the

1 position of the first measurement that exceeds a
2 predetermined threshold V_0 , correct?

3 A Right.

4 Q And X_2 is the last -- the position of the
5 last measurement before the voltage drops back below
6 that predetermined threshold?

7 A That's right.

8 Q And X_A is the midpoint between X_1 and X_2 ,
9 correct?

10 A That's right.

11 Q If the car in Odachi were parked off
12 center, meaning closer to where the primary coil
13 starts, then X_1 and X_2 and X_A would all shift
14 leftward in Figure 5, correct?

15 MR. CORBETT: Objection to form.

16 A How much is the car displaced to the
17 left?

18 Q Well, I'm just asking, in general, if the
19 car were -- began its position -- strike that. Let
20 me try again. I'll try to be more clear.

21 If, as compared to Figure 5, Odachi's
22 vehicle were parked closer to the starting position

1 of the primary coil, X1, X2, and XA would all shift
2 leftward on the ground, correct?

3 A By a little bit.

4 Q And if the car were positioned off center
5 far enough, it's possible that you could have a
6 scenario where X1 is at the very first measurement
7 taken, the X equals zero position, right?

8 A No.

9 Q Why not?

10 A If you look at Figure 11, the car has to
11 stop in the 4 direction at blocks 130. And if the
12 car is displaced to the right, it can only be
13 displaced by one tire width before the Y position of
14 the car is not going to be established. The car
15 will crash into the primary coil-holding apparatus.
16 So no, I don't think you can get to X1.

17 Q I apologize. Please continue.

18 A Sorry?

19 Q I apologize. I didn't mean to cut you
20 off. Were you finished with your answer?

21 A I didn't realize you cut me off. So
22 yeah, I finished my answer.

1 Q Okay. So looking at Figure 11, it is
2 possible that the car could be parked further to the
3 right in this figure, correct?

4 A By a small amount.

5 Q Why do you say only by a small amount?

6 A Well, because of the tire blocks defining
7 where the car has to be centered in order to
8 establish the Y coordinate. If the driver missed
9 the tire blocks, then the car would crash into
10 the -- would crash into the whole apparatus 220 and
11 290.

12 So you really only have the width of one
13 tire in order to shift to the right. And it's
14 unclear whether you could shift all the way to the
15 position X1.

16 Q Certainly, the person parking the car in
17 Odachi could park the car further to the right,
18 missing the tire blocks, but still park the car in
19 the same Y position, right?

20 MR. CORBETT: Objection to form.

21 A So you're asking me about a scenario
22 where the driver intentionally ignores the centering

1 directions for driving the car to the apparatus,
2 gets it all the way to the right-hand boundary of
3 the garage, misses the tire stoppage blocks, and has
4 to determine not to crash the bumper into the
5 apparatus while not being able to see it?

6 That's the scenario you're proposing?

7 Q I'm not saying it's intentional or not.
8 I'm asking, understanding that this means the car
9 may miss the tire blocks, if you agree that it is
10 possible for Odachi's car to be parked in some area
11 such that the X1 position is at the first
12 measurement taken?

13 MR. CORBETT: Objection to form.

14 A I don't believe it could.

15 Q Is that because it's physically
16 impossible somehow?

17 A Yes.

18 Q Why is it physically impossible?

19 A Well, you're asking me to believe,
20 referring to Figure 5, that the car is parked at X1.
21 How would it know its reference relative to what it
22 would have received if it was parked on center? In

1 other words, it would have no concept that it had
2 moved from zero VRMS in the plot of Figure 5 through
3 the threshold and up to a peak. It would start at
4 V_0 , and how would it know what the baseline was?
5 That would be one reason.

6 And the other reason is, I don't believe
7 that that is a realistic scenario that would
8 actually happen in practice.

9 So is it possible the driver could put
10 wings on the car and fly out of the garage? Sure.
11 But I don't believe a driver would drive the car in
12 the way you're describing.

13 Q You must have a lot better faith in the
14 average American driver than I do.

15 With respect to Figure 5, X_1 is the point
16 at which the first measurement is taken that exceeds
17 the predetermined reference value V_0 , right?

18 A Yes.

19 Q And so it is possible that the very first
20 measurement taken exceeds V_0 , right?

21 MR. CORBETT: Objection to form.

22 A I suppose theoretically, that's possible,

1 but not in any practical way.

2 Q Because it would require an exceptionally
3 poor parking job by Odachi's driver?

4 A I rescind that statement. I'm not
5 putting down Japanese drivers. It's a Japanese
6 patent.

7 But seriously, you're counting on there
8 to be space such that there's enough swing room for
9 the primary coil to go across the secondary coil and
10 cross over V0 and then be able to come back to the
11 center point at XA.

12 But in doing that, you haven't specified
13 enough parameters such that the primary would be
14 able to center on XA and not bump into the wall or
15 whatever on the region to the left of XA on these
16 plots.

17 Q Well, the primary is not going to bump
18 into a wall because it has a defined region, right?
19 The area in which the primary moves is stationary;
20 it's not affected by the parking job.

21 A Oh, that's not true at all.

22 Q I'm sorry. Are you saying that in

1 Figure 11, the primary could hit a wall depending on
2 how the car is parked?

3 A By "hit a wall," I mean the stopping
4 point of its travel is what I mean by "hit a wall."

5 Q Okay. So I think we kind of went past
6 this, but I'll ask again.

7 Understanding that it may be unlikely, do
8 you agree that it is possible that the car in Odachi
9 is parked such that the very first VRMS measurement
10 taken, point X1, exceeds the reference value V0?

11 MR. CORBETT: Objection to form, asked
12 and answered.

13 A You're saying the very first parking
14 spot, the induced voltage exceeds V0? That's your
15 question?

16 Q Yes.

17 A Theoretically, it is possible.

18 Q So for one example, if the car was parked
19 such that, in Figure 11, the primary coupler was
20 essentially directly underneath the secondary
21 coupler, then probably the very first measurement
22 would exceed V0, right?

1 MR. CORBETT: Objection to form.

2 A Let's say that's true.

3 Q I'm asking you.

4 A I'll accept the word "probably."

5 Q Okay. In other words, it is possible
6 that Odachi's driver parks the car in a position
7 such that the secondary coupler is already perfectly
8 aligned with the primary coupler in the X direction?

9 MR. CORBETT: Objection to form.

10 A You're saying it's aligned at XA?

11 MR. CORBETT: Objection to form of the
12 last question.

13 Q I'm asking if that's possible.

14 MR. CORBETT: Same objection.

15 A Restate what's possible. You've confused
16 me.

17 Q So I think before, we were asking about
18 X1. I'm asking a slightly different question, which
19 is, it's possible that the car in Odachi is parked
20 such that the secondary coupler is perfectly aligned
21 with the starting position of Odachi's primary
22 coupler, meaning that after Odachi performs its full

1 positioning, it would be back to the very point it
2 started in because that would be the best coupled
3 position, right?

4 MR. CORBETT: Objection to form.

5 A I still believe that it's not possible.

6 Q Because it's -- there's some physical
7 impossibility or because you think it's unlikely
8 that someone would park in that manner?

9 MR. CORBETT: Objection to form.

10 Q I gather that you're reading something to
11 answer my question.

12 A Yes, yes.

13 Q Okay.

14 A You're asking me about a scenario that is
15 more than unsupported in Odachi. Odachi teaches
16 away from the scenario you're talking about.

17 So you're asking me to contemplate a
18 scenario where the driver intentionally misuses the
19 system and compensates for the misuse by somehow
20 knowing when the wheels would have reached the
21 stopping blocks if they were aligned with the
22 stopping blocks, and then can precisely line up the

1 secondary on the car with the primary that's all the
2 way to its home position, and would you be able
3 to -- if you did that perfectly, would you be able
4 to detect the threshold level X1?

5 I suppose you could. But just because
6 it's possible doesn't mean it is taught in Odachi,
7 and it is not. All of Odachi says the car must
8 align with the stopping block and mentions it at
9 least six times in the specification.

10 So that's the best answer I can give you.

11 Q Okay. So let's look at Odachi starting
12 at column 11, line 17. And I just have a general
13 question.

14 So Odachi describes aligning its primary
15 coupler in the x-axis direction by measuring either
16 IRMS in the primary coil or VRMS in the secondary
17 coil, correct?

18 A Yes.

19 Q And if we look at Odachi, column 14,
20 line 29, it says, Positioning of the primary coupler
21 in the vehicle longitudinal direction may be
22 conducted in the same method as in the positioning

1 along the x-axis.

2 Do you see that?

3 A I see that.

4 Q So Odachi teaches that alignment along
5 the y-axis can be performed in the same manner as
6 alignment along the x-axis, correct?

7 A Yes, it does say that.

8 Q And that would include positioning of the
9 primary coupler in the y-axis direction by measuring
10 either IRMS in the primary coil or VRMS in the
11 secondary coil?

12 A Presumably, yes.

13 MR. ZUCKER: We've been going about
14 another hour. Why don't we take a ten-minute break,
15 come back at 35 after.

16 (Recess from 3:27 p.m. until 3:37 p.m.)

17 BY MR. ZUCKER:

18 Q Welcome back, Dr. Horenstein.

19 Did you speak to anyone during the break?

20 A I did not.

21 Q Earlier we were talking about Odachi's
22 couplers.

1 Do you recall that?

2 A I do.

3 Q Does Odachi's primary coupler transmit
4 energy?

5 A I would say it transfers energy.

6 Q What's the distinction you're drawing
7 between transfers and transmits?

8 A Well, "transmit" implies that it's
9 radiating. I do not believe there's any radiation
10 coming out of Odachi's primary.

11 Q Why do you think "transmit" implies that
12 it's radiating?

13 A Because I've been working with
14 transmitters since about age 12, and "transmit"
15 means, in electrical engineering, produce radiating
16 energy when it's applied to things involving AC
17 excitation.

18 Q Okay. Do you agree that Odachi's
19 secondary coil receives energy?

20 A Yes.

21 Q Okay. And do you agree that Odachi's
22 primary coil transfers energy to its secondary --

1 strike that.

2 Do you agree that Odachi's -- I think I
3 said coil. Let me start that again.

4 Do you agree that Odachi's secondary
5 coupler receives energy?

6 A Yes.

7 Q Do you agree that Odachi's primary
8 coupler transmits energy?

9 A No.

10 Q Do you agree that Odachi's primary
11 coupler transfers energy?

12 A Yes.

13 Q And when Odachi's primary coupler has an
14 AC current running through it, it transfers energy
15 that is then received by Odachi's secondary coupler
16 via mutual induction, correct?

17 A Yes.

18 Q We talked earlier about Figure 11 of
19 Odachi. And in Figure 11, the secondary coupler is
20 center mounted in the vehicle, correct?

21 A Correct.

22 Q There's no requirement in Odachi that

1 that be the case, correct?

2 MR. CORBETT: Objection to form.

3 A I'm reading, just so you know.

4 Q I appreciate that.

5 A To answer your question, I couldn't find
6 anything that says the secondary has to be in the
7 center, but I found nothing that said it shouldn't
8 be in the center.

9 Q If the secondary was always exactly in
10 the center, you arguably wouldn't need Odachi's
11 positioning system at all because you could just
12 keep the primary directly in the center, right?

13 A No.

14 MR. CORBETT: Objection to form.

15 Q What part of that is incorrect?

16 A You're relying on the driver to always
17 perfectly position the car correctly in the X
18 direction.

19 Q Okay. And so there will be some cases
20 where the driver of Odachi will not perfectly
21 position the car in the X direction, correct?

22 A Correct.

1 Q Is there any technical reason that
2 Odachi's system could not work if it had a
3 non-centered vehicle coil?

4 MR. CORBETT: Objection to form.

5 A It would have subpar performance compared
6 to the secondary being located in the center of the
7 car.

8 Q Why would it have subpar performance if
9 it can be -- if there can be alignment between the
10 primary and the secondary either way?

11 A Well, you have to count on there being
12 driver parking -- parking position error in both
13 directions in the X direction. And if you placed
14 the secondary on the car all the way over to one
15 side, you would not be able to correct for the
16 deviations in parking position in both directions,
17 only in one direction.

18 So theoretically, it could work, but it
19 would be a suboptimal way to do things. And I think
20 a person of skill looking at the Odachi invention
21 would arrive at the same conclusion, that it would
22 be best to keep it in the center.

1 Another reason for wanting to do it is
2 just sheer balance of weight in the vehicle to keep
3 heavy things centered around the centerline of the
4 car.

5 Q So your understanding of Odachi assumes
6 that the person of ordinary skill reading Odachi is
7 going to need to account for imperfect parking?

8 A I think it's a given. Why would you need
9 the alignment system if you weren't going to have to
10 deal with imperfect parking?

11 Q Is it possible that the vehicle could
12 have an off-centered secondary coil such that the
13 very first measurement taken at position X equals 0
14 crosses the V0 reference threshold while the tires
15 are still on the tire stops?

16 MR. CORBETT: Objection to form,
17 incomplete hypothetical.

18 You can answer.

19 A Too hypothetical a question. I mean, as
20 always, many things are possible. It doesn't mean
21 that that's what Odachi is disclosing in the patent.

22 I could come up with a gazillion other

1 scenarios to indicate why your system wouldn't work,
2 but that would require pure speculation.

3 There's nothing in Odachi that suggests
4 putting the secondary off center. Could you do it?
5 I suppose you could. It wouldn't be the best way to
6 design the system because the parking error could be
7 either to the right or to the left, and you'd want
8 to have enough balance in the horizontal direction
9 to be able to correct for both those errors.

10 So in principle, you could do it. I
11 don't think Odachi would want you to do it.

12 Q If you had a car with an off-center
13 secondary coil and it parked against the tire stops
14 in Odachi's Figure 11, it could be the case that the
15 very first VRMS measurement is position X1, correct?

16 MR. CORBETT: Objection to form, asked
17 and answered.

18 A In a hypothetical world you are
19 constructing that confounds all reality, yeah, it's
20 possible.

21 Q Why does that scenario confound all
22 reality?

1 A Because no engineer would design a system
2 in that way, quite frankly. A person of skill being
3 the engineer would automatically assume that the
4 secondary coil has to be preferably in the center,
5 possibly slightly off center, but not at such an
6 extreme direction that it hits the home rest
7 position of the primary coil, which is what you're
8 saying.

9 The opportunity to totally miss that
10 point is way too probable that you wouldn't be able
11 to hit the point where you aligned at the X1
12 coordinate upon parking the car.

13 Q Looking at Figure 1, the distance from
14 where the secondary coil is in its centered position
15 to where the secondary coil would need to be such
16 that the initial measurement is position X1, it's
17 only a couple of inches, right?

18 A Figure 1?

19 MR. CORBETT: Objection to form.

20 Q Figure 11, sorry.

21 MR. CORBETT: I'm sorry, Dave. I was
22 making the objection. Which figure is the question

1 about?

2 Q So looking at Figure 11, the distance
3 from where the centered secondary coil is located to
4 the distance you would need to move the secondary
5 coil such that the initial measurement is position
6 X1 is only a couple of inches, correct?

7 MR. CORBETT: Objection to form, lacks
8 foundation.

9 A I don't think that's true. I don't think
10 you'd know what the physical span between X1 and X2
11 is in practice.

12 Q In Figure 11, how far in the X direction
13 is Odachi's primary coupler from Odachi's secondary
14 coupler?

15 A Well, granted there are no reference
16 points -- no scales, rather, by which one can
17 determine what that distance is. I think it's hard
18 to say.

19 What you don't know is, assuming perfect
20 alignment is with the centers of the primary and
21 secondary coils being aligned, how far out you have
22 to go to get to X1 and X2. And so there's no way of

1 knowing how far away those transition points are
2 relative to the secondary.

3 Moreover, that will change with a
4 difference in vertical height between the primary
5 and the secondary.

6 So if you're counting on hitting X1 by
7 putting the secondary all the way over to the side
8 of the car, when you park the car, that would be a
9 terrible way to design the system.

10 Q You're saying that positions X1 and X2
11 will change as a result of vertical distance between
12 the primary and secondary?

13 A Yes, absolutely.

14 Q Why is that?

15 A That's the nature of the spread of the
16 field lines being produced by the primary, and so
17 the height of the secondary is going to be dependent
18 on what kind of car you're parking and what the
19 diameter of the wheels are and what's the distance
20 to the ground, from the chassis to ground. That's
21 going to differ from car to car.

22 So the reason Odachi does it the way it's

1 done is that it can discern two points, X1 and X2,
2 which won't be spaced the same distance away from
3 car to car, but they'll be equidistant from the
4 center point XA where you want the two couplers
5 aligned.

6 Q So let's go back to your Exhibit 2010 and
7 look at paragraph 104. And you've drawn a modified
8 version of Odachi's Figure 7.

9 Is that right?

10 A Paragraph 104. That's correct.

11 Q Can you explain to me what you've drawn
12 here?

13 A Well, I'm looking at the suggestion in
14 the petition and Dr. Allen's declaration that --
15 sorry, I'm not seeing the relevant picture in my
16 declaration, but that a structure of the type shown
17 in Partovi, which has multiple primary coils, that
18 somehow that would work with Odachi so that you
19 wouldn't have to worry about the X direction
20 location of the car.

21 So I came up with an artist's concept of
22 what was suggested, and I used Dr. Allen's report --

1 or declaration as my reference point, the kind of
2 modification he was talking about to improve the
3 x-axis range of the system, and simply suggesting
4 that it would not work very well.

5 If you look at the exploded -- the
6 close-up picture on the top of page 53, it
7 illustrates the problem one would have with taking
8 Partovi's approach and applying it to the Odachi
9 structure.

10 Q So in the version of Odachi that you've
11 drawn on the bottom of page 52, what is the support
12 arm connected to?

13 A It's just a very wide horizontal support
14 attached to the support arm.

15 Q I'm not sure I follow.

16 A Well, if you look at the things that are
17 blue, red, and green, those are multiple Odachi
18 primaries. And at the leftmost unit, kind of next
19 to the numeral 44 in the diagram, you see there's
20 the support arm.

21 And presumably, there's a horizontal
22 support not shown in the figure that's supporting

1 all those primary coils.

2 Q Okay. So you say, a couple sentences
3 above, that the primary windings would not be able
4 to move relative to the vehicle's secondary coil.

5 Do you see that?

6 A Show me. I'm not sure I do.

7 Q So the third sentence of paragraph 104
8 says, Doing so with Odachi's actual primaries,
9 however, would not lead to coverage across the range
10 of the primaries because the primary windings would
11 not be able to move relative to the vehicle's
12 secondary coil.

13 Do you see that?

14 A Yeah, you've got to finish the sentence,
15 though.

16 Q Well, my question is, is it true that in
17 this combination of Odachi and Partovi that you've
18 drawn, that primary windings are unable to move
19 relative to the vehicle's secondary coil?

20 A No. They're only able to mesh with the
21 secondary coil at discrete spots.

22 Q Okay.

1 A That's what that sentence means. And the
2 last part sums it up, such that only a few discrete
3 spots on Odachi's axis.

4 So what that means is, the primary
5 windings are all attached together, and one
6 particular primary winding can't move by itself
7 relative to the secondary coil.

8 So they all have to move together, and
9 therefore, only a few discrete spots along Odachi's
10 x-axis can mate with the secondary.

11 Q But the primary windings collectively are
12 able to move relative to the vehicle's secondary
13 coil, correct?

14 A Well, as a unit whole, they can. But as
15 you see in the picture at the top of page 53, if you
16 misaligned a particular primary with the secondary,
17 you wouldn't be able to lift up the array of
18 primaries to create meshing.

19 Q Oh. If, for example, the secondary coil
20 that you've shown on the top of figure -- page 53
21 was, say, three inches to the left, you could just
22 move the entire array of primaries three inches to

1 the left, right? That would solve the problem?

2 A Well, you're asking me to justify what I
3 consider a really unrealistic application that
4 Dr. Allen thought up, and you're asking me to
5 justify it.

6 Q To be clear --

7 A I think it's a really silly
8 implementation where one can just take a single
9 primary and move it by carriage from left to right
10 along the x-axis.

11 And also, supposedly, Dr. Allen's
12 rendition will improve the horizontal range by which
13 the primary can engage a secondary. But I say, just
14 make the whole apparatus wider and you'll improve
15 the horizontal range.

16 So the point here is, a skilled person
17 would have no incentive whatsoever to import the
18 ideas of Partovi into Odachi because it's just
19 unrealistic and a very impractical way to do things.

20 MR. ZUCKER: Move to strike all of that
21 as not responsive to the question.

22 A Well, restate your question, please.

1 Repeat your question.

2 Q So the question is, do you agree that the
3 primary windings that you've shown on Figure 7 on
4 the bottom of page 52 can move relative to the
5 vehicle's secondary coil?

6 MR. CORBETT: Objection to form.

7 A In which direction?

8 Q Along the x-axis.

9 A They can move as an aggregate array along
10 the x-axis.

11 Q Okay. Thank you.

12 MR. ZUCKER: Why don't we take a
13 five-minute break, let's go off the record, and I'll
14 see if I have anything further.

15 (Recess from 3:59 p.m. until 4:04 p.m.)

16 MR. ZUCKER: I have no further questions.
17 Thank you, Dr. Horenstein.

18 MR. CORBETT: I have no questions for you
19 either, Dr. Horenstein.

20 COURT REPORTER: Anything else for the
21 record?

22 MR. ZUCKER: Not from InductEV.

1 MR. CORBETT: No, not from WiTricity's
2 side.

3 (Transcript orders discussed.)

4 COURT REPORTER: Thank you. That's all
5 we need.

6 (Off the record at 4:06 p.m.)

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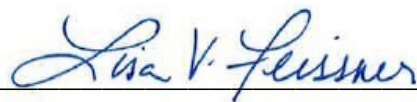
22

1 C E R T I F I C A T E

2 I, Lisa V. Feissner, RDR, CRR, CLR, do
3 hereby certify that the witness was first duly sworn
4 by me and that I was authorized to and did report
5 said proceedings.

6 I further certify that the foregoing
7 transcript is a true and correct record of the
8 proceedings; that said proceedings were taken by me
9 stenographically and thereafter reduced to
10 typewriting under my supervision; that reading and
11 signing was not requested; that I am neither
12 attorney nor counsel for, nor related to or employed
13 by, any of the parties to the action in which this
14 deposition was taken; and that I have no interest,
15 financial or otherwise, in this case.

16 IN WITNESS WHEREOF, I have hereunto set
17 my hand this 21st day of JANUARY, 2025.

18
19 

20 Lisa V. Feissner, RDR, CRR, CLR

21 (The foregoing certification of this
22 transcript does not apply to any reproduction of the
same by any means, unless under the direct control
and/or supervision of the certifying reporter.)

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