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2	
3	UNITED STATES PATENT AND TRADEMARK OFFICE
4	
5	BEFORE THE PATENT TRIAL AND APPEAL BOARD
6	
7 8	HTC CORPORATION, HTC AMERICA, INC. and APPLE INC.,
0	Petitioners
9	V.
10	INVT SPE LLC, Patent Owner.
11	
12	
13	Case Nos. IPR2018-0155 and IPR2018-01581 U.S. Patent No. 7,848,439
14	
15	
16	
17	DEPOSITION OF
18	ZHI DING, PH.D.
19	Tuesday, December 3, 2019
20	
21	
22	
23	
24	
25	REPORTED BY: Brandi N. Bigalke, RPR, RSA

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1	The following is the deposition of ZHI	
2	DING, PH.D., taken before Brandi N. Bigalke, RPR,	
3	RSA pursuant to Notice of Taking Deposition, at	
4	Best Western Plus Palm Court Hotel, 234 D Street,	
5	Davis, California.	
6		
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2	I N D E X
3	EXAMINATION PAGE
4	Mr. Morton4
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6	
7	EXHIBIT INDEX
8	PREVIOUSLY-MARKED EXHIBITS REFERRED PAGE
9	HTC EXHIBIT 10014
10	U.S. Patent 7,848,439
11	HTC EXHIBIT 100345
12	U.S. Patent 6,904,283
13	HTC EXHIBIT 1004107
14	U.S. Patent 7,221,680
15	HTC EXHIBIT 1005141
16	U.S. Patent 6,721,569
17	HTC EXHIBIT 100624
18	U.S. Patent 5,596,604
19	HTC EXHIBIT 1007109
20	Declaration of Zhi Ding, Ph.D. in Support of
21	Petition for Inter Partes Review
22	HTC EXHIBIT 101624
23	Declaration of Zhi Ding, Ph.D. in Support of
24	Petitioners' Consolidated Reply to Patent Owner's
25	Consolidated Response

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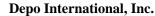




	ic. and Apple file. vs. five 1 SFE LLC
1 PROCEEDINGS	¹ adjusted in accordance to the conditions.
Whereupon, the deposition of ZHI DING, PH.D.	² Q. Right.
³ was commenced at 8:34 a.m. as follows:	And what happens in general is you
4	⁴ have a pilot signal or something like that, user
5 ZHI DING, PH.D.	⁵ equipment or wireless device, handheld device
⁶ Called as a witness and having been first duly	⁶ can measure, right?
⁷ sworn, testifies as follows:	7 MR. FRANKLIN: Objection; vague.
8 EXAMINATION	8 THE WITNESS: Could you break down
9 BY MR. MORTON:	⁹ the question a bit better?
Q. Good morning, Dr. Ding. I assume	10 BY MR. MORTON:
11 you've had your deposition taken before?	Q. Well, you're the expert. This is
12 A. Yes. Good morning. Yes, I have	¹² adaptive modulation and coding. I thought this
13 had depositions taken before.	13 was basic stuff.
Q. Okay. And you've had time to	So you describe to me how adaptive
15 prepare for this deposition with counsel?	¹⁵ modulation and coding works.
16 A. Some time, yes.	16 A. To make the adjustment of
Q. And is there any reason you can	17 modulation and coding, the transmitter needs to
18 think of why you cannot hear my questions, and	18 be aware of the necessity to make adjustment on
19 give full, true and honest answers here today?	¹⁹ the modulation and coding. And what conditions
²⁰ A. No.	20 necessitates that needs to be available to the
Q. Okay. Let's dive right in and talk	21 transmitter.
22 about the '439 patents. I have it there in front	Q. Okay. And how do the conditions as
²³ of you. It's Exhibit 1001 to this IPR	²³ you call them, how are those made available to
²⁴ proceeding.	²⁴ the transmitter?
Do you see that? Page 4	25 A. There is several ways that can Page 6
¹ A. Yes.	¹ that can be made aware to the transmitter.
² Q. Okay. With reference to Column 2	² Q. Okay. What are the ways?
³ of that patent, if you want to have that open for	3 A. For example, the transmitter may
4 your reference.	⁴ simply be looking at the channel that the
5 So Column 2 is some of the under	5 transmitter is also receiving data on from the
6 the section called The Background of the Art in	6 mobile station, and based on the principal of
7 the '439 patent.	⁷ reciprocity, the transmitter can estimate the
8 Do you see that?	8 conditions of the forward link channel, and in
9 A. Yes.	⁹ accordance to that condition of the channel make
10 Q. Okay. And it talks about adaptive	¹⁰ adjustments to the adaptive to the modulation
¹¹ modulation and coding based on subcarriers.	¹¹ and coding scheme that the transmitter is about
12 A. Which line are we referring to?	¹² to use.
Q. If you look at Column 2, lines 4	13 Q. Okay.
14 through 8, it's introducing that concept.	14 A. That's one.
15 A. Okay. I see Column 2, right.	Q. What's another way?
16 Q. And Column 2 talks about you	16 A. Sorry?
¹⁷ understand what adaptive modulation and coding	Q. What's another way?
18 is, right?	18 A. Another possibility is that the
19 A. I understand that as a general	19 transmitter simply does not have sufficient power
²⁰ concept, yes.	²⁰ to transmit at you're running out of power or
Q. Okay. So just for the record then,	²¹ battery, so you have to dial down the modulation
²² what is adaptive modulation and coding?	²² complexity simply because higher modulation
23 A. It's a mechanism where depending on	²³ requires more power.
²⁴ the conditions necessary, the modulation and	24 Q. Okay.
	25 A. Yeah.

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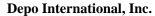




1 Q. And another way?	1 reporter.)
2 A. Other ways includes that the	THE WITNESS: On a per subcarrier
3 transmitter may perceive that there's a strong	3 basis. And same answer for AMC based on subband
4 likelihood of having interference in for the	4 basis. Per subband basis.
⁵ channel that the transmission will take place.	5 BY MR. MORTON:
⁶ So again, in accordance you are likely to add	6 Q. So the '439 patent acknowledges
7 additional redundancy to protect your	7 that AMC based on subcarriers was known and that
8 redundancy in the error forward error	8 AMC based on subbands was known prior to the
⁹ correction code to protect the data you're	9 invention, right?
¹⁰ transmitting.	10 A. Yes.
Q. Okay. Is that all the ways?	11 Q. Okay. And when we're talking
12 A. No.	12 about what's the difference between a
Q. What's another one?	13 subcarrier and a subband?
14 A. What's another one. Well,	14 A. Okay. So in this context, in the
15 conditions generally includes the transmitter	15 context of '439, subbands contains one or more
16 itself whether it have enough powers to do	16 subcarriers.
17 something, or the way to perceive the channel	Q. Okay. And those are the
18 condition change, whether the forwarding channel	18 subcarriers would be neighboring on the frequency
19 has changed.	19 domain, is that right, to make up a subband?
So I've given you a list of ways	A. Generally, no, but you certainly
21 that the transmitter can perceive that change.	21 can make it contiguous. You can have contiguous
Q. Is there a reason that you're	22 subcarriers forming a subband, but it's also not
²³ avoiding the situation of the user equipment	23 necessary in general.
²⁴ making a measurement on the downlink on a pilot	Q. Okay. You actually put in your
25 signal and then reporting something back up to Page	
¹ the transmitter?	¹ subcarriers on a frequency domain, right?
MR. FRANKLIN: Objection;	² A. I may have.
³ argumentative.	Which side?
4 THE WITNESS: No.	4 Q. What's that?
5 BY MR. MORTON:	5 A. Where is that in the declaration?
6 Q. Okay. Well, let's talk about that	6 Q. It would be in the claim
7 since that's what's in Column 2 that I pointed	7 construction portion of your opening declaration
8 to.	8 says that, and it may repeat it in your secondary
9 Do you see where it says, "AMC in	⁹ declaration.
¹⁰ OFDM is divided into two, AMC based on	10 A. I'm sorry, what was the question?
¹¹ subcarriers and AMC based on subbands."	11 Q. I'm just asking you to confirm that
Do you see that?	12 you actually defined subbands you said
13 A. Okay. Yes.	13 subbands don't have to have subcarriers
Q. Okay. So any of the things you	14 neighboring on the frequency access?
15 describe, was any of that AMC based on	15 A. Right.
16 subcarriers?	Q. I'm asking you isn't it true that
17 A. Yeah. It can be done based on	17 you actually defined subbands as having
18 subcarriers.	18 subcarriers neighboring on the frequency?
19 Q. Okay. What's AMC based on	19 A. I'm just asking you to refresh my
²⁰ subcarriers?	20 memory. I don't remember where I wrote that, and
21 A. That's the granularity with which	²¹ I certainly would own up to it if it is written
²² you are making adjustments of modulation.	22 that if I said that subbands necessarily have
²³ Therefore, the adjustment of different modulation	²³ to have subcarriers in a contiguous relationship.
²⁴ is done on a per sip subcarrier basis.	Q. It would be in your opening
²⁵ (Clarification by the court	g 25 declaration which you have there. Page 11

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