

Page 1 1 UNITED STATES PATENT AND TRADEMARK OFFICE 2 ----- 3 BEFORE THE PATENT TRIAL AND APPEAL BOARD 4 ----- 5 HANSHOW AMERICA INC. AND HANSHOW TECHNOLOGY CO., LTD., 6 Petitioner, 7 v. 8 SES-IMAGOTAG SA, 9 Patent Owner, 10 ----- 11 Case No. IPR2024-00189 12 U.S. Patent No. 11,674,340 13 14 15 16 REMOTE DEPOSITION OF EMMANOUIL (MANO) M. TENTZERIS, PhD 17 Friday, August 23, 2024 18 12:05 p.m. - 1:23 p.m. EST 19 20 21 22 Job No.: 12403 23 Pages: 1 - 45 24 Stenographically Reported By: Cara Foster, RPR, 25 CA CSR No. 11973	Page 3 1 A P P E A R A N C E S 2 3 ON BEHALF OF THE PETITIONER: 4 ARCH & LAKE LLP 5 By: Hao Tan, Esq. 6 10900 NE 4th Street 7 Suite 2300 8 Bellevue, Washington 98004 9 425.289.7858 10 haotan@archlakelaw.com 11 12 ON BEHALF OF THE PATENT OWNER: 13 PERKINS COIE LLP 14 By: Jessica Kaiser, Esq. 15 1900 Sixteenth Street 16 Suite 1400 17 Denver, Colorado 90202 18 303.291.2300 19 kaiser-ptab@perkinscoie.com 20 21 ALSO PRESENT: 22 Matthew Lembo, Perkins Coie LLP 23 Ellen Ji, Arch & Lake LLP 24 Mano Avaldi, Arch & Lake LLP 25
Page 2 1 Deposition of EMMANOUIL (MANOS) M. TENTZERIS, PhD, 2 conducted virtually via Zoom videoconference. 3 4 5 6 7 8 Pursuant to notice, before Cara M. Foster, 9 Registered Professional Reporter and Stenographic 10 Certified Shorthand Reporter Number 11973, in and for 11 the State of California and Stenographic Certified 12 Shorthand Reporter Number 23006866, in and for the state 13 of Washington. 14 15 16 17 18 19 20 21 22 23 24 25	Page 4 1 I N D E X 2 PAGE 3 EMMANOUIL (MANO) M. TENTZERIS, PhD 4 Examination by Ms. Kaiser..... 5 5 6 7 8 E X H I B I T S 9 EXHIBIT DESCRIPTION PAGE 10 1006 United States Patent No.: US 2007/0024436 A1 11 Date of Patent: Feb. 1, 2007..... 36 12 1008 CV of Manos (Emmanouil) M. Tentzeris..... 9 13 14 1009 Declaration of Dr. Manos M. Tentzeris in 15 Support of Petition for Inter Partes Review 16 of U.S. Patent No. 10,674,340..... 40 17 2002 Declaration of Emmanouil M. Tentzeris, Ph.D 18 in Support of Certain of DeCurtis LLC and 19 DeCurtis Corporation's Proposed Claim 20 Constructions..... 27 21 22 23 24 25

P R O C E E D I N G S * * * THE STENOGRAPHER: We are going on the record. The time is 12:05 a.m. I would like to introduce myself. My name is Cara Foster. I am your California CSR for today. My license number is 11973. Before I swear in the witness, would counsel place their appearances on the record, please? MS. KAISER: Jessica Kaiser from Perkins Coie on behalf of the Patent Owner. MR. TAN: Hao Tan from Arch Lake for Petitioner. EMMANOUIL (MANOS) M. TENTZERIS, PhD, was called for examination, and after having been duly sworn in under penalty of perjury by the stenographic certified shorthand reporter, was examined and testified as follows: EXAMINATION BY MS. KAISER: Q. Good morning, Dr. Tentzeris, or good afternoon where you are. Can you state your full name for the record, please? A. It's Manos Tentzeris. My official name is	Page 5 1 understand that you've been deposed before, but I still 2 want to give you a few rules of the road so that we're 3 on the same page. 4 A. Sure. 5 Q. I'm going to do my best to ask you clear 6 questions. But if for some reason you don't understand 7 a question, then I'll ask that you let me know so that I 8 can clarify it. 9 Does that make sense? 10 A. Yes. 11 Q. But if you answer, then I'm going to assume 12 that you understood my question, okay? 13 A. Sure. 14 Q. The court reporter needs for you to give verbal 15 answers so that she can take everything down. 16 Do you understand that? 17 A. Yes, I do. 18 Q. And if you're looking at a document and you are 19 reading it, I'll ask that you either read it out loud 20 and slowly enough so she can take everything down that 21 you say or that you read it silently to yourself so she 22 doesn't have to. 23 Do you understand that? 24 A. Yes. 25 Q. There may be times during your deposition that
Page 6 Emmanouil Tentzeris but everybody is using Manos for the last, I'd say, 30 years. Q. And where are you located today? A. I'm located in Atlanta, Georgia. Q. Is there anyone in the room with you? A. No. No. Q. Do you have any hard copy documents with you? A. No hard copy documents. Everything is electronic. Q. Okay. And the electronic documents that you have with you, what are they? A. These are the exhibits that I was sent by the lawyers. So just to give you a description, let me look. 0189 to -- I have Exhibit 1001 as a part of discussion, 1002, prosecution history. 1035 translation and 1004, 1005 Anson, 1006 Bandy, 1007 Fowler, 1008 CV, and 1009 the expert declaration. Q. Okay. And do any of the documents that you have electronically have notes or highlighting in them? A. Nothing at all. Q. Okay. So they are clean copies? A. Yes. Q. Okay. I know when we met last Friday, we talked about your experience as a witness, and I	Page 8 1 I am pointing to a specific part of a document to orient 2 you so you know the context of my question. But I'll 3 ask that you let me know when you are at the place that 4 I've asked you to go to, but wait until I ask an actual 5 question before you talk about that section. 6 Does that make sense? 7 A. Yes. 8 Q. As we talked about, the court reporter is 9 taking down everything that we say. So I think we've 10 been doing a good job of this so far, but I'll try not 11 to interrupt you or talk over you until you've finished 12 your answer, and I'll ask that you do the same for me. 13 When I'm asking a question, try to pause and let me 14 finish my question before you start your answer. 15 A. Great. 16 Q. Your counsel may object from time to time, but 17 you still need to answer my question unless he 18 specifically instructs you not to answer. 19 Do you understand that? 20 A. Yes. 21 Q. And then we'll take breaks from time to time. 22 I'll try to do that about every hour. But if you get to 23 a point where you need a break, I ask that you just let 24 me know. 25 A. Sounds good.

1 Q. Okay. I'm going to point you to your CV in the 2 089 IPR. 3 A. Okay. Let me open it up. 4 Q. It's 1008. 5 A. Great. 6 Q. It will be in the chat. Hold please. 7 A. Yes, let me open it. Okay. 8 Q. Do you recognize Exhibit 1008 as your current 9 CV? 10 A. There are additional publications and 11 additional depositions that are not listed in the CV. 12 That was the state -- it was not up to date until June 13 of 2023. So there may be significantly more 14 publications you may find, more awards, and also more 15 depositions. I hold more conferences and organization 16 events. 17 Q. Okay. I want to go to -- you have a number of 18 publications listed in your CV. And, obviously, I can't 19 possibly ask you about all of them, but I want to point 20 you to the section that starts on page 12 of the PDF, 21 and the section is "Published Books and Parts of Books." 22 Do you see that? 23 A. Yes. 24 Q. And then if you go down to page 22 under that 25 section --	Page 9 1 inductive coupling. And that has, I'd say, the most 2 common implementation. There are very few 3 demonstrations working with electric field near field 4 coupling, but mostly it is magnetic field coupling. 5 That is correct. 6 Q. And the commercial implementations are the 7 magnetic inductive coupling? 8 A. Apart from a couple of systems in Portugal and, 9 I believe in Austria, the rest of the implementations 10 are taken advantage of in inductive coupling; that is 11 correct. 12 Q. Okay. And for NFCs that use magnetic inductive 13 coupling, they use coiled antennas to create the 14 magnetic field; correct? 15 A. They use a combination of components. So 16 typically, NFC systems, I would consider this to be a 17 subsystem of the RFID technologies. So mostly they 18 utilize an antenna, which is the coil for the magnetic 19 field. They utilize IC, Integrated Circuit, that's what 20 I meant. And they may utilize, depending on the 21 implementation of the additional components, which have 22 to do with matching circuits or else we call modulation 23 components aiming and optimizing the power transfer and 24 the power coupling. And also have potentially 25 additional component enabling it to combine more
Page 10 1 A. Yes. 2 Q. Do you see there that there is a book chapter 3 that's titled, "Integrating Tiny RFID and NFC Based 4 Sensors with the Internet"? 5 A. That is correct. 6 Q. And as you sit here now, do you have a 7 recollection of that book chapter? 8 A. Not many details. It was published about 10 9 years ago. So given the fact that I've written more 10 than 30 chapters and 500 publications, plus -- I know 11 that they had to deal with RFID and NFC-based essentials 12 within the Internet, but that's all I recall. I don't 13 recall details. 14 Q. In your experience, you are familiar with NFC 15 technology; correct? 16 A. Yeah, I've been involved since the invention of 17 NFC, before the NFC console was put together by NXP, 18 Sony, and Nokia. So the NFC alliance was put together, 19 I believe, around early 2000, and I've been quite 20 involved with them since. 21 Q. And NFC stands for Near Field Communication? 22 A. Exactly. 23 Q. And NFC works through magnetic identical 24 coupling; is that correct? 25 A. That is correct. Mostly works with magnetic	Page 12 1 standards. 2 You know, one of the issues of the NFC, as I'm 3 sure you're well aware of, had to do with 4 standardization and the typical standards, and that was 5 one of the drivers for us to spend time with this. Most 6 of the people tended to think about the 14443. I mean, 7 this is a well-known national standard for NFC that was 8 shared with RFIDs. 9 And especially for the NFC systems, the main 10 challenge had to do with the standards. For example in 11 Japan, there was a different standard, like FeliCa. 12 But eventually, I would say the answer to your 13 question is, a coiled antenna and IC or a microchip are 14 the fundamental elements of this type of device. 15 Q. Okay. And just to be clear, if we focus just 16 on the function of the NFC component that's creating the 17 magnetic fields, that's a coiled antenna; correct? 18 A. Can you clarify what you mean by "function" 19 because you said the function and a coiled antenna. 20 Can you explain to me what function you are 21 talking about? 22 Are you talking about the inductive coupling or 23 are you talking about -- 24 Q. The portion of the NFC device that is creating 25 the magnetic field for inductive coupling is the coiled

1 antenna? 2 A. For those taking advantage of inductive 3 coupling it's a coil. 4 Now, talking about a coiled antenna, that could 5 have different implementations. Mostly, I would say, an 6 element that is able to process or manipulate magnetic 7 field, and coil is one of it. 8 Q. Okay. And for the implementations of NFC that 9 use magnetic inductive coupling and those would use a 10 coiled antenna in the reader and a coiled antenna in the 11 tag; is that right? 12 A. In general, talking about commercial NFC 13 readers, they're quite similar to verified readers to 14 identify the systems. So you have to have a reader 15 providing some energy to the tag. The tag, which is the 16 NFC, I'd say, transmits a transponder, so the reader 17 provides some energy to the NFC transponder or IC tag, I 18 would say, the communication. And then this would allow 19 the interrogation of this enabling it to respond back 20 with some data. 21 So talking about NFC and talking about possibly 22 verifying this, you are talking about a lack of local 23 power source. That means you have a reader and you have 24 a transponder. Typically, that's the configuration. 25 And most of the time, since you asked me about	Page 13 1 they are talking about transfers, we might have talked 2 about this. 3 As I told you, most of the NFC systems or most 4 of the verified systems have multiple transponders. So 5 most of the time, it depends on the application. For 6 example, if you have an application where you have 7 multiple transponders, as you asked me, interference 8 would be an issue, but there are ways to deal with that. 9 So since this problem came up from the onset of 10 the NFC technologies, I remember in 2006 -- definitely 11 it was 2006, when Nokia integrated the first NFC reader 12 in the cell phone and there was some preliminary tests 13 of NFC tags, I believe in France, there was some French 14 shops -- I cannot recall the city that it took place. 15 They figured out that -- especially in this case -- that 16 interference was an issue. And in a sense, they're 17 aware through major issues, I would say, for an NFC and 18 verified tags in proximity of each the other one, was 19 interference. And there were ways of time division, 20 multiplex division, multiplex to resolve it for the 21 readers. So there was required added intelligence to 22 the reader. 23 That enabled -- I mean, if you look at the 24 current systems, you can interrogate, for example, 1,000 25 transponders at the same time without any collision. Page 15
Page 14 1 the system, you have the reader and you have multiple 2 transponders. That's the advantage of them. So you 3 could have one reader being able to interrogate numerous 4 NFCs or verify the responders. 5 The principle is quite similar whenever you are 6 talking about HF. I'm talking about HF and I'm 7 stressing that because you are asking me about typical 8 NFC systems. You're talking about systems that operate 9 at 13.56 megahertz, which is one of the major 10 standardized frequencies, either for NFCs or, in 11 general, about HF. 12 Q. So if you assume a system, an NFC system that 13 only has one reader and one tag, each of the reader and 14 tag would have a coiled antenna; correct? 15 A. In general, yes. In order to have 16 some inductive coupling, this involves magnetic lines. 17 So you have to have a source of magnetic lines and an 18 interceptor of magnetic lines, that's how the magnetic 19 coupling takes place. 20 Q. Okay. When designing an NFC system, is it 21 important to consider interference that could affect the 22 magnetic field? 23 A. It depends on the operation or scenario. So 24 typically -- I believe there were some details in this 25 book chapter. I cannot recall the details, but since	Page 16 1 The second challenge was, and I would say that 2 it was more important, had to do with security. And 3 that's also given in most of the patents that we're 4 talking today. Security or resilience to spoofing or to 5 hacking was really important. And that's why you had 6 the variety of, I'd say, proximity-based standards. 7 So just to give you an explanation for this. 8 Whenever you need to have security, whenever you want to 9 have, I'd say, known hacking, there were ranges below, I 10 would say, 50 centimeters. Like 10 centimeters, 5 11 centimeters that had to do with the power transmitted by 12 the reader. So that was challenge number two. 13 One was interference. Well-known people spend 14 time on this. Second was security. And the third had 15 to do with the impact of the environment. So many times 16 these systems were suffering because of the special 17 location they were utilized. 18 For example, if you place any of the systems 19 next to water or detergent, there's no way you can 20 interrogate them even down to a 2 centimeters or less. 21 So there were three challenges. I would say and agree 22 with you that interference was one of them. 23 Q. Okay. And I appreciate that context. 24 So you said three problems that someone 25 designing the NFC system would look at are: One

1 interference, two security, and three the environment; 2 is that right? 3 A. Exactly. That is correct. 4 Q. I want to ask you about the third one that you 5 mentioned, environment? 6 A. Yes. 7 Q. And you mentioned one thing was next to 8 water -- 9 A. Yes. 10 Q. -- that could cause problems with being able to 11 read the NFC. 12 Another environmental consideration would be 13 proximity to metal; is that correct? 14 A. That could be; although you're utilizing a 15 magnetic field in this case. So since you're utilizing 16 the magnetic field, the impact of metal is not as 17 dramatic as it would be if you used an electronic field. 18 You know, metal pretty much affects conductors and 19 that's why people are utilizing the MRI for diagnostics 20 because the magnetic field does not attenuate or does 21 not reflect back from metals the same way that the 22 electric field does. 23 So since it was magnetic field based, mostly 24 you focus on a nonmetallic impact. The only effect that 25 the metals would have is something we call -- pretty	Page 17	1 below the wavelength of the frequency of operation so 2 electronically small distances. 3 And the higher frequency RFID detox, they are 4 working in the far field around for the use of antennas 5 much more complicated than coils. Antennas that take 6 advantage of both the electric and the magnetic field, 7 instead of just the magnetic field. 8 Q. Okay. So I think one of the things you said is 9 that the NFC is designed to work at small distances; is 10 that right? 11 A. Most of the time. So I would say the NFC is 12 designed to work at distances as we call in the 13 "vicinity area". That means distances typically below 14 50 centimeters. And then depending on the 15 environment -- as we said, these ranges can change. So 16 you could have a nominal range of 50 centimeters, and 17 then for some collaborative environment with water as we 18 said or detergent, this could go down to 10 centimeters 19 or it could go to 2 centimeters. 20 And the other approach is actually taking 21 place in most of the retail stores -- because I was 22 involved in some recent publications as well with 23 Qualcomm and everybody, talking about NFC and smart 24 inventories, one of the issues we noticed was that even 25 the reader could modify the range. So normally it be	Page 19
1 much every person in this case -- it is the waveguiding 2 effect. 3 So the idea of this is if you have two parallel 4 metals, you are in a corridor, you are in an aisle, and 5 then the field is constrained between these two metallic 6 areas. So it's not the kind of a loss, it's more a kind 7 of constraint in the field and maybe stretching the 8 magnetic locks. 9 So I would say the major issue had to do with 10 non-metallic surfaces. The magnetic field I would say 11 is more secondary. That would be an impact for higher 12 circumstances because -- I mean, NFC are mostly 10.56 13 megahertz. But, for example, for RFIDs they're 14 three-dominant solutions. One is in kilohertz. 135 15 kilohertz. The second is 13.56 megahertz. Exactly the 16 same frequency with NFC. For these frequencies, metal 17 impact is not very specific. And 900 megahertz, which 18 is the type of verified that's been utilized nowadays 19 because they are smaller, but pretty much they get 20 killed whenever you have a metal around it because they 21 don't rely on inductive coupling, but they rely mostly 22 on regular antenna radiation impact. 23 So the variation effectively is NFC and HF 24 RFIDs with magnetic coupling operating the principals of 25 what we call "near field". That means distances way	Page 18	1 below 50 centimeters, practically it could be much 2 smaller by just reducing the radiated power, or not 3 paying attention to the environment. But I would say 50 4 centimeters is a good ballpark value for all of these 5 proximity devices. 6 Q. And then in an answer earlier you mentioned 7 RFID typically being used for far field communication. 8 Do you remember that? 9 A. No, what I said is they are two different types 10 of RFIDs. There are the low frequency operating at 11 135 kilohertz or the high frequency, which we call HF, 12 operating at 13.56 megahertz that operate in near field 13 or very similar to an NFC in a sense. NFC is a subcase 14 to verify this, how we would treat them and operate at 15 near field. 16 And then RFID operating at much higher 17 frequencies at 900 megahertz, they operate at long 18 range, and that's why I said verify this kind of super 19 space for NFCs because they operate in a much wider 20 frequency range. So lower frequencies, megahertz both 21 RFID and NFC work in the near field. Higher frequency, 22 900 megahertz, 433 megahertz and even 5G frequencies 23 they are far field. So variety offers more options. 24 Q. Okay. Are you familiar with the term "UHF" or 25 "Ultimate High Frequency" RFID?	Page 20

Page 21 1 A. Yes. 2 Q. And -- 3 A. Sorry, for interrupting. Please. 4 Q. And UHF RFID operates in far field; correct? 5 A. UHF RFIDs operate in UHF frequencies, and 6 typically these frequencies are higher than 7 100 megahertz. So we will consider them to be in 8 frequencies. The rule of thumb for UHF is pretty much 9 frequencies that TVs are working so frequencies higher 10 than effect. 11 Q. And UHF RFIDs, you said, are far field 12 communications? 13 A. If they operate at frequencies higher than 433 14 megahertz, yes. If they operate at frequencies around 15 900 megahertz or lower, they can utilize both near and 16 far field. The coupling point is around 100 megahertz 17 in my opinion. 18 Q. Are you familiar with the term or with -- 19 strike that. 20 Are you familiar with microwave RFIDs? 21 A. Can you be more specific? What you're asking 22 me now is one of the topics of a real extensive debate 23 on RFID committee. 24 I mean, this has been the big discussion since 25 2009 because before RFIDs people used to consider	Page 23 1 A. I meant five zero. 2 Q. Okay. 3 A. Five zero because, I would say, with the NXP 4 sensitive devices -- it has to do with sensitivity of 5 the chip or the NFC. NXP and Sony came up with 6 sensitive ones, allowing 50 centimeters. 7 Now, I would say, this is the upper bound, the 8 50 centimeters. And then raised on the properties of 9 the chips you utilize -- for example, if you are in low 10 cost company and utilize chipper IC, this one could be 11 30 centimeters, this one could be 20 centimeters, but I 12 would say 50 centimeters is the peak, is the maximum 13 range I would use for NFC transponders. 14 Q. You mentioned earlier the "standardization 15 process" for NFCs. 16 A. Yes. 17 Q. Does the standardization or does -- strike 18 that. 19 Do the standards allow for 50 centimeters? 20 A. Again, that's a good question because most of 21 the standards talk about maximum allowable magnetic 22 field, maximum allowable power. These are the two 23 metrics people utilize. So you can play with that, the 24 same way the cell companies play with the power 25 limitations because you may define the allowable power
Page 22 1 microwaves or radio frequencies quite high frequencies. 2 Now after the RFIDs put out RFID identification 3 devices, then people extended the frequency range of 4 radio frequencies in the microwave down to kilohertz, 5 and you can see that. If you check the publication 6 record -- I'm really happy you asked this question 7 because I discussed this pretty much when we have an 8 RFID discussion with some experts. 9 If you look at the publications of the biggest 10 microwaves in the International Microwaves Symposium, 11 before 2009, all publications were above 100 megahertz 12 as we say UHF. Then after 2010, you could see 13 publications of microwave devices operating at 13.56 14 megahertz. 15 So the short answer is, after the adoption and 16 implementation of NFC and RFID devices, microwave 17 frequencies included every frequency above 18 135 kilohertz. That was the lowest frequency of 19 verified operability. 20 Q. I have one point of verification from earlier 21 when you were talking about NFC and you were talking 22 about a baseline range. 23 And I think the court reporter took down 24 50 centimeters, five zero, and I'm asking you to clarify 25 whether you meant five zero or one five centimeters?	Page 24 1 in many different ways. Most of the companies for NFC, 2 for example NXP, they sold a larger range for the same 3 power and the same amount of the magnetic field because 4 the chip is more sensitive. 5 So you can think of this as you have a device 6 that can measure -- that can respond if you have more 7 than 1 millionth of a watt. And then you have another 8 chip that can respond if you receive .1 millionth of a 9 watt. So I would say it's a matter of implementation, 10 and that's why I said, in my opinion -- and that would 11 be a person of ordinary skills opinion -- the 50 12 centimeters would be the best range. It could be 13 smaller, but I would say not larger than 50 centimeters 14 with very sensitive chips. 15 You asked me before about the fundamental 16 components, and that's the coil and the chip. So any 17 time you're talking about a range, there are two 18 factors. One is the coil, so how many magnetic lines it 19 intercepts. And then the chip, whether it can work with 20 few magnetic lines or many magnetic lines. These are 21 the two factors. 22 Q. In terms of -- I'm talking about NFCs still. 23 A. Sure. 24 Q. Are you familiar with active NFCs? 25 A. Sure. Sure.

1 Q. An active NFC means that both the reader and 2 the tag have their own power source and can generate 3 their own magnetic fields independent of one another; is 4 that fair? 5 A. That's fair. 6 Q. And are you familiar with the term "passive 7 NFC"? 8 A. Yes. Passive NFC, in my opinion -- and that is 9 a generic opinion -- the transponder or the NFC tag does 10 not have its own power source and it's exclusively 11 powered by, as we call, the gateway or the interrogator 12 or the reader, they are different terms for the reader. 13 You can call it "gateway". You can call it "collection 14 point", but I would say an NFC reader, yeah, or the 15 power is coming out from the NFC reader. 16 Q. Okay. And just to be clear, when you have 17 passive NFC, the reader's magnetic field powers the tag; 18 is that right? 19 A. When you have -- can you say that again because 20 you broke off? 21 Q. Sure. 22 When you have passive NFC, the reader's 23 magnetic field powers the tag? 24 A. That's exactly the case. It's the same 25 definition between passive and active RFIDs. It's	Page 25 1 coil means intercepting more magnetic lines. And that 2 means, even if the magnetic field is below the 3 standards, still the aggregation of magnetic lines will 4 provide sufficient magnetic energy to activate this. 5 And the third one, as I told, is the 6 sensitivity of the microchip. So the sensitivity of the 7 microchip has to do with the amount of power it needs to 8 stop. So it could be really low or it could be really 9 high. So these are the three factors for the range. 10 And do not forget the environment. I mean, 11 that's a thing. So if you place a bottle of detergent, 12 then the range is 1 centimeter, always. I want to 13 stress that. 14 Q. You mentioned the environment again. I'm going 15 to give you an exhibit in the chat. This will be a new 16 one. We'll mark this as Exhibit 2002. 17 (Exhibit 2002 marked for identification.) 18 BY MS. KAISER: 19 Q. It's downloading. Give it a moment. Let me 20 know when you have it. 21 A. Okay. Let me download it. Let me open it. 22 Okay. 23 Q. So do you see that Exhibit 2002 is titled 24 "Declaration of Emmanouil M. Tentzeris, PhD, in support 25 of certain DeCurtis LLC and DeCurtis Corporation's Page 27
Page 26 1 exactly the same definition. Because if you look at the 2 RFID tags, active means the tag has its own power 3 source. Passive RFID tags means it's activated by the 4 power of the reader. Exactly the same principle. 5 Passive/active NFC tags and passive/active RFID tags are 6 exactly the same definition. 7 Q. Okay. And then we talked a little bit earlier 8 about the operating distance between the reader and the 9 tag in the NFC system. 10 If you want to increase that operating 11 distance, then you would either need to increase the 12 power or the size of the antenna; is that right? 13 A. Not completely. 14 Q. Okay. 15 A. We discussed this before. So the first factor 16 is the power, obviously. So the power from your reader, 17 if you increase the power, then you can increase the 18 range. Typical, as we call, near field formulas. You 19 know how fast the power goes down, you know the magnetic 20 field and the near field attenuates S1 over distance to 21 the third power. So you know how fast the power will 22 attenuate so 1 is the power. That's the first one, but 23 that's also the riskier one because it may violate 24 standards. 25 The second one is the coil size. So the larger	Page 28 1 proposed claim constructions?" 2 A. Yes. 3 Q. And Emmanouil Tentzeris is you; correct? 4 A. That is correct. 5 Q. Okay. And you see that this is a document that 6 was filed in a case in the United States District Court 7 for the Southern District of Florida? 8 A. Yes. 9 Q. And if you go to page 36 of the PDF, you see a 10 signature at the bottom of that page? 11 A. Yes, I see a signature. That is correct. 12 Q. Is that your signature? 13 A. Yes, that's my signature. 14 Q. Okay. If you can go to paragraph 54 of 15 Exhibit 2002? This is on page 14 of the PDF. Let me 16 know when you are there. 17 A. 54, okay. Let me read paragraph 54. 18 Q. You can read it to yourself, if you'd like, and 19 then I'll have some questions for you. 20 A. Okay. Also it says, "another design." And 21 there are different dimensions of these designs so let 22 me start at 53 and go to 54. 23 Okay. I read the two paragraphs. Okay. 24 Q. And if you look at paragraph 54, the second 25 sentence, do you see it says, "In either case, however,

Page 29 1 a person of ordinary skill in the art would recognize 2 that to prevent electromagnetic interferes, a minimum of 3 10 millimeters (0.3937 inches) buffer in all directions 4 between the NFC antenna and other antennas or metal 5 surfaces is required." 6 Do you see that? 7 A. Yes, I can read the sentence. Yes. 8 Q. And then as support for that you cite the 9 Texas Instruments Antenna Design Guide. 10 Do you see that? 11 A. Yes, although I cannot recall what the other 12 antennas were. The other antennas were metal surfaces. 13 The way I read this is, there's going to be a buffer 14 between the NFC antenna and other antennas that I cannot 15 recall what they were or the metal surfaces to have this 16 buffer of .1 centimeters, okay. 17 Q. So then you agree that an NFC antenna needs a 18 buffer between itself and metal surfaces to avoid 19 interference? 20 A. You are asking me whether any of them buffer 21 from metal surfaces or buffer from other antennas, so 22 what is the question? 23 Q. From metal surfaces? 24 A. Okay. So I cannot recall the details of this. 25 I mean, this declaration was written for some cruise	Page 31 1 metals do not introduce loss or do not introduce 2 interference. They are mostly spreading the frequency 3 spectrum. I mean, typically for the NFC, if you see the 4 standards, the standard frequency is 13.56 5 megahertz plus or minus something because in nature 6 there's nothing that's one specific number. 7 Now, when you place metals that spread the 8 frequency effectively increasing the amount of power you 9 need to interrogate it, and that's why we utilize this 10 Q factor justification. It's well-known. What is 11 happening is, if you have a metal next to the coil -- 12 qualitatively it can be explained this way and that's 13 not interference. 14 So you have a coil. And if you place another 15 metal close to the coil, this one creates geometry of 16 two metals in proximity. Two metals in proximity 17 effectively realizes the capacitor. The capacitor is 18 antagonizing the inductor performance because capacitors 19 in electrical fields effectively reduce the inductance, 20 and that's why you have this spreading of the spectrum 21 and the drifting. So it does not have to do with 22 interference. It has mostly to do with how -- what's 23 the amount of the power to interrogate this tag. 24 Q. Okay. And I appreciate the additional 25 explanation.
Page 30 1 environment. So if I recall correctly -- and I would 2 need to read more of this. The idea -- the question was 3 how far an NFC antenna should be from a metal lock -- 4 can you say that again? 5 Q. A metal what? 6 A. Metal lock. A lock. 7 And if I recall correctly -- and I'll have to 8 refresh my memory -- I remember roughly that the problem 9 was an NFC antenna or an NFC system that you can mount 10 on a cruise room lock and then you use your cruise card 11 to enter your room. So the question was whether this 12 impact, not the interference, but the amount of power 13 you would need to interrogate it. And that's why the 14 discussion was about the Q factor. 15 Now, in paragraph 54, three lines from the 16 bottom, the impact is reducing the Q factor. Now, 17 the Q factor does not have to do with interference. 18 Q factor typically has to do with the quality factor 19 that is defined as the drifting around the center 20 frequency. So metal would not interfere. It would just 21 create some frequency drifting that would require the 22 reader of this lock to pump up the power. 23 So it was not a matter of interference. It was 24 a matter of spreading the frequency spectrum, and that's 25 exactly what's happened, as I told you, with metal. So	Page 32 1 But you'd agree that when you are designing an 2 NFC system, you would consider metal surfaces and the 3 buffer between the antenna and the tag and metal 4 surfaces? 5 A. Between the antenna and the tag from metal -- 6 so you're asking me whether, as you have a buffer 7 between the antenna, tag topology, and nearby metals or 8 are you asking me whether there was a buffer between the 9 coil and the tag -- the coil and the microchip? 10 Q. Let me clarify my question. I appreciate you 11 asking for clarification because I think it's the former 12 of what you said. 13 So when you're designing an NFC system, you 14 would consider having a buffer between the antenna in 15 the tag so the topology of the antenna in the tag and 16 nearby metals in the environment? 17 A. Okay. 18 MR. TAN: Objection. Form. 19 THE WITNESS: So in general -- in general, most 20 of these systems -- most of these NFC transponders, they 21 utilize enclosures. And the enclosures they utilize are 22 most of the time realizing this spacing. 23 I don't think that in general applications this 24 buffer is important. Applications where you have lock 25 topologies or highly magnetic topologies that extend on

1 all six sides of the tag, adding this buffer would allow 2 the interrogation with the lower amount of power. 3 I mean, even not adding the buffer, that would 4 allow the interrogation, if you pumped up the power from 5 your interrogator. But for the device where you have 6 metal boxes all around, like metal locks which was the 7 topic of this, that would be a way to minimize the 8 battery consumption of a reader. 9 So for these specific applications for electric 10 locks, yeah, that would be a good suggestion. But 11 performance wise, an alternative way would be to pump up 12 the power from the reader and you would have the same 13 input. 14 BY MS. KAISER: 15 Q. When you are designing an NFC system, is it 16 correct that ideally you would want the coiled antenna 17 of the tag and the coiled antenna of the reader to be in 18 parallel planes? 19 A. You are talking about magnetic coupling, and 20 magnetic coupling involves magnetic lines. Now, even if 21 you are misaligned, slightly misaligned, you could be 22 like, I'd say, all the way up to 30 degrees of 23 misalignment, still you are going to be able to 24 intercept some magnetic lines. 25 I mean, this is the topic, I would say, of more	Page 33 1 Q. And in ultra-high frequency RFID communication 2 occurs using backscatter; is that correct? 3 A. I would say in some cases, yes. Backscattering 4 is typically an effect which has to do with passive 5 RFIDs. So backscattering means -- that's what is 6 exactly said about a month ago talking about 7 backscattering, that's already online, that's all 8 backscattering. 9 So backscattering means that the transponder is 10 passive. So the transponder has no source which means 11 you have your reader, you have your gateway that 12 radiates energy, and then based on the return signal 13 from this passive device most of the time. 14 There are some active backscatters but for 15 defense applications, but I would say 99 percent 16 backscattering means the transponder is passive. You 17 obtain some information. And backscatter is not only 18 UHF. Backscattering is also taking place in HF. The 19 same thing. 20 So backscattering in general would be the 21 electromagnetic effect that transmits some radiation, 22 some electromagnetic field, magnetic or electric, then 23 your transponder returns back a specific amount of this, 24 and then based on this return you obtain information. 25 That's the backscatter.
Page 34 1 than 1,000 publications reported right now of the effect 2 of misalignment. I'd say the optimum case, in general 3 when you have two coils in proximity, would be to be 4 aligned and complainer. That would be the two plans to 5 be parallel if you have the coils. 6 Still, in reality, it never happens. So for 7 example, if you utilize your phone to pay at the 8 restaurant with contactless pay, I don't think you know 9 where the coil of the reader in the restaurant is. You 10 just bring it close and that's how it works. 11 So ideally that would be great if they were 12 aligned. Practically, all the systems have some leeway 13 from misalignment of at least, I'd say, 30 to 40 degrees 14 and still work okay. 15 Q. Okay. And the more misalignment there is, you 16 would have to look at those three factors you talked 17 about before which are: Power, coil size, or 18 sensitivity of the microchip in order to address the 19 misalignment? 20 A. Yes, it would be the power, that would be the 21 coil size orientation, and the microchip. 22 Q. We talked earlier about ultra-high frequency 23 RFID. 24 Do you remember that? 25 A. Yes.	Page 36 1 What's happening in reality in the NFC and RFID 2 tags, is the backscattered power is changing as the 3 function of time and that realizes 0's and 1's which is 4 the data sequence or unique ID transmitted back. So 5 this is not only UHF but it pretty much happens on all 6 frequencies. Backscatter happens all around us. 7 Q. If you could pull up Exhibit 1006, which is the 8 bandwidth reference. 9 A. 1006 just give me a second. 10 MR. TAN: Is this going to be marked? 11 MS. KAISER: This is one of the exhibits that 12 was filed in the 189 IPR, so this is Exhibit 1006. 13 MR. TAN: I'm asking, are you going to mark 14 this an exhibit for this deposition? 15 MS. KAISER: No. For purposes of the 16 deposition, the exhibits that have already been marked, 17 I'm just keeping their exhibit number as filed in the 18 IPR. 19 MR. TAN: Okay. 20 THE WITNESS: I'm ready. 21 BY MS. KAISER: 22 Q. And Bandy is one of your references that you 23 relied on for your opinions in the 189 IPR; correct? 24 A. That is correct. 25 Q. If you go to paragraph 77 of Bandy, which is on

1 page 16 of the PDF. Let me know when you are there. Page 37 2 A. Okay. 3 Q. You see there is a sentence that says, 4 "Exemplary interrogation protocols are described in U.S. 5 Patent Number 6,002,344 issued December 14, 1999, to 6 Bandy, et al., entitled System and Method for Electronic 7 Inventory and U.S. Patent application Serial Number 8 10/072,885, filed on February 12, 2002, both of which 9 are incorporated by reference herein in their entirety." 10 Do you see that? 11 A. Yes. 12 Q. In forming your opinions in this case, did you 13 review U.S. Patent Number 6,002,344? 14 A. When I reviewed this patent, I can recall I had 15 reviewed these reference patterns. I cannot recall the 16 details right now because it's been quite some time. 17 But specifically about these interrogation protocols, 18 they were protocols that are quite close to the EPC 19 standards for the interrogation to verify this. 20 You can see information, not identical to this 21 patent, but quite similar in Franken Zeller's RFID 22 handbook. So there were patents having to do with 23 mostly implementing some standards utilizing 24 backscattering and load modulation, and also discussing 25 about different encoding of data to communicate for	1 Yeah. Page 39 2 Q. You mentioned a couple of phone calls with the 3 counselors. When was the first phone call to prepare 4 for the deposition? 5 A. I believe that was, like, a couple of weeks ago 6 when we tried to schedule the dates. So it was a couple 7 of weeks ago, maybe a little bit earlier. Around two 8 weeks ago. 9 Q. And who was present on that phone call? 10 A. It was, I believe, Mr. Hao and there were two 11 more people. I cannot recall the names. 12 Q. And how long did that phone call last? 13 A. I believe it was a couple of hours. 14 Q. And then was there a second phone call? 15 A. Yes, there was a second phone call. Again, a 16 couple of weeks ago. 17 Q. And that was to prepare for this deposition? 18 A. In general, about the depositions. So for this 19 deposition, there was a very quick call. I think it was 20 about 20 minutes, mostly about the procedure. So 21 talking about the time to start, talking about the time 22 to finish, and raising issues of construction of the 23 venue. So in the sense there was no discussion about 24 the deposition after last Friday. 25 Q. Okay. Did you make any notes to prepare for
1 RFIDs. Page 38 2 So I cannot recall the details from these 3 documents. It's been quite some time. I think I 4 reviewed it about, like, a year and a half ago, but I 5 believe the notes told me that the protocols were quite 6 similar to the ones listed in major RFID reference as 7 Franken Zeller so Class 0, Class 1. They were close to 8 the eyes of 14443, the eyes of 15693, ECMA 340, and also 9 the 18000 standards. 10 So there were specific protocols typical for 11 RFID interrogation there. 12 MS. KAISER: Okay. We've been going for about 13 an hour. I think this would be a good time to take a 14 break. Let's go off the record. 15 (Off the record: 1:05 p.m. - 1:15 p.m.) 16 BY MS. KAISER: 17 Q. Dr. Tentzeris, welcome back. 18 What did you do to prepare for your deposition 19 for the 189 IPR? 20 A. I reviewed, again, the exhibits, and I 21 refreshed my memory about the declaration, and I had a 22 couple of phone calls with the counselors to discuss 23 general topics about the declaration -- about the 24 deposition. 25 You asked me about the deposition; is that it?	1 today's deposition? Page 40 2 A. No, no notes at all. 3 MR. TAN: I would also caution the witness to 4 not discuss the communications with counsel. 5 Thank you. 6 THE WITNESS: Thank you. 7 BY MS. KAISER: 8 Q. I'm going to give you Exhibit 1009 in the 9 189 IPR. 10 A. Okay. I just opened it. 11 Q. Do you recognize Exhibit 109 in the 189 IPR as 12 your declaration in that proceeding? 13 A. That is correct. 14 Q. When were you retained for the 189 IPR? 15 A. Can you say that again because, again, you 16 broke off? 17 Q. When were you retained for the 189 IPR? 18 A. Oh, that was some time ago. I guess late 2022, 19 early 2023. Quite some time ago. I cannot recall the 20 exact date. 21 Q. Do you recall when you started drafting your 22 declaration for the 189 IPR? 23 A. It was about, I'd say, a month before the 24 submission. A month or a month and a half. I cannot 25 recall the exact dates, but it was about a month before

Page 41 1 we submitted it. 2 Q. And can you describe generally your process for 3 drafting your declaration in Exhibit 1009? 4 A. I reviewed the patent under discussion of 340A, 5 I reviewed some prior art, also I reviewed some 6 additional exhibits like the prosecution history as 7 well, and then I started putting together the 8 declaration. So the patent 340 prior art and some other 9 relevant documents and exhibits. 10 Q. For the prior art references in Exhibit 1009 11 that you relied on in the unpatentability grounds, did 12 you find those references yourself or were they provided 13 to you? 14 A. We coordinated actually with the counselors. I 15 found some, some others were suggested, I reviewed them, 16 and then I formed my opinion. So I would say it was my 17 choice. And then some other prior art was suggested, I 18 reviewed it, saw if it helped me form my opinion, and I 19 formed my opinion. 20 Q. And your opinions for the 189 IPR are contained 21 in Exhibit 1009; correct? 22 A. That is correct. 23 MS. KAISER: I don't have any further questions 24 on the 189 proceeding, so I'll pass the witness to 25 Mr. Tan.	Page 43 1 WITNESS'S CHANGES OR CORRECTIONS 2 Deponent: EMMANOUIL (MANOS) M. TENTZERIS, PhD 3 NOTE: If you are adding to your testimony, print the 4 exact word/words you want to add. If you are deleting 5 words from your testimony, print the exact word/words 6 you want to delete. Specify with "Add" or "Delete" and 7 sign below. 8 PAGE LINE CHANGE/ADD/DELETE 9 _____ 10 _____ 11 _____ 12 _____ 13 _____ 14 _____ 15 _____ 16 _____ 17 _____ 18 _____ 19 Pursuant to Section 2025.520 of the Code of Civil 20 Procedure of the State of California, I hereby certify 21 that I have read my Statement Under Oath transcript, 22 made those changes and corrections that I deem 23 necessary, and approve the same as now true. 24 25 Date: _____ Signature: _____
Page 42 1 MR. TAN: Right now I don't have anything to 2 redirect at this moment. 3 Do you want to take a break for now or do you 4 want to just keep going? 5 THE WITNESS: I'd say let's keep going. I just 6 had a break if it's okay with Jessica. It's up to 7 you. 8 MS. KAISER: Let's go off the record and we can 9 discuss logistics. 10 MR. TAN: I would like a rough of the 11 transcripts and the finals in three days, including 12 yesterday's deposition. 13 MS. KAISER: I would like the same, please. 14 THE STENOGRAPHER: Okay. I will inform 15 Focus Litigation to contact yesterday's court reporter 16 for the update. 17 We are going off the record. The time is 18 1:23 p.m. 19 * * * 20 21 22 23 24 25	Page 44 1 DECLARATION UNDER PENALTY OF PERJURY 2 3 4 Case Name: CYIARK VS. INGLEWOOD SPORTSERVICE, INC. 5 6 Date of Deposition: Friday, August 23, 2024 7 8 9 I, EMMANOUIL (MANOS) M. TENTZERIS, PhD, hereby 10 certify under penalty of perjury under the laws of the 11 State of 12 _____ that the foregoing is true and 13 correct. 14 15 Executed this _____ day of 16 _____, 20____, at _____. 17 18 19 20 21 _____ 22 EMMANOUIL (MANOS) M. TENTZERIS, PhD 23 24 25

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That EMMANOUIL (MANOS) M. TENTZERIS, PhD, the witness whose deposition is hereinbefore set forth, was duly sworn by me before the commencement of such deposition and that such deposition was taken before me on Friday, August 23, 2024, commencing at 12:05 p.m. - 1:23 p.m. EST, and is a true record of the testimony given by such witness.

IN WITNESS WHEREOF, I have hereunto set my hand this
28th day of August, 2024.

Cara M. Foster
RPR, CSR No. 11973

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