

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC.
Petitioner

v.

CARUCEL INVESTMENTS L.P.
Patent Owner

Case IPR2019-01102
Patent 7,848,701

**DECLARATION OF SCOTT A. DENNING IN SUPPORT OF
PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE**

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VW GoA v. Carucel
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I, Scott A. Denning, declare as follows:

I. Introduction

1. I have been asked by Volkswagen Group of America, Inc. (“VWGoA”) to provide expert opinions in the above-captioned *Inter Partes* Review proceeding involving U.S. Patent No. 7,848,701 (“the ’701 patent”), which is entitled “Mobile Communication System With Moving Base Station.”

2. Specifically, I have been retained as a technical expert by VWGoA to study and provide my opinions on the technology claimed in, and the patentability or unpatentability of, claims 10, 15-18, 31 and 33-35 of the ’701 patent (“the Challenged Claims”). For purposes of this declaration, I was not asked to provide any opinions that are not expressed herein.

3. I previously submitted a declaration in support of the Petition for *inter partes* review of U.S. Patent No. 7,848,701 (“the ’701 patent”). This declaration is in support of Petitioner’s Reply to Patent Owner’s Response in IPR2019-01102.

4. I understand that Patent Owner submitted a Response (Paper 12) (“POR”) and the declaration of Mark R. Lanning in support of the POR. I have also been asked to provide my technical review, analysis, and insight regarding both the Patent Owner’s response and Mr. Lanning’s declaration in support thereof.

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5. My background and qualifications were provided in paragraphs 6-12 of my original declaration, Exhibit 1003, and my CV was provided as Exhibit 1004. My statements in my original declaration regarding my review of the '701 patent and related materials remain unchanged. In reaching my opinions, I carefully reviewed Patent Owner's Response, the Petition for *Inter Partes* Review of the '701 patent, my original declaration, and the materials reviewed as part of my original declaration. In addition, I reviewed and refer to the following materials:

Paper	Description
2	Petition
12	Patent Owner's Response

Exhibit	Description
1035	Declaration of Mark Lanning in Support of Defendants' Responsive Claim Construction Brief, <i>Barkan Wireless IP Holdings v. Samsung Elecs. Co. Ltd.</i> , Case No. 2:18-cv-00028 (E.D. Tex.), filed December 21, 2018. ("Lanning Barkan Decl.")
1036	Definitions of "automotive," "vehicle," and "traffic," <i>Oxford Desk Dictionary</i> , Oxford University Press, 1995; pp. 38, 611, and 640. ("Oxford Desk Dictionary")
1037	<i>Cessna Model 152 Information Manual</i> , Cessna Aircraft Company, July 1, 1979. ("Cessna")
1038	"Digital Cellular Land Mobile Telecommunication Systems," Rec. ITU-R M.1073-1, ITU Radiocommunication Assembly, 1994-1997. ("ITU")
1039	Transcript of the Deposition of Mark R. Lanning, June 2, 2020.

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Exhibit	Description
1040	Transcript of the Deposition of Mark R. Lanning, June 3, 2020 (“Denning Depo. Tr.”)
1041	Transcript of the Deposition of Mark R. Lanning, June 4, 2020 (“Denning Depo. Tr.”)
1042	Transcript of the Deposition of Mark R. Lanning, June 5, 2020 (“Denning Depo. Tr.”)
1043	U.S. Patent No. 5,621,784 to Tiedemann, Jr., et al. (“Tiedemann784”)
1044	U.S. Patent No. 6,292,651 to Dapper, et al. (“Dapper”)
1045	Runway Safety: A Best Practices Guide to Operations and Communications, Federal Aviation Administration (“FAA Runway Safety”)
1046	U.S. Patent No. 5,289,527 to Tiedemann, Jr., et al. (“Tiedemann527”)
1047	Pyndiah, R., et al., “Performance of Block Turbo Coded 16-QAM and 64-QAM Modulations,” <i>Proceedings of GLOBECOM</i> ’95, Vol. 2, November 14-16, 1995; pp. 1039-1043. (“Pyndiah”)
1048	Jakubowski, R. J., “A New Generation of High-Power Cellular Repeaters,” <i>40th IEEE Conference on Vehicular Technology</i> , May 6-9, 1990; pp. 24-28. (“Jakubowski”)
2100	Declaration of Mark R. Lanning in Support of Patent Owner’s Response to the Petition (“Lanning Decl.”)

6. I have also reviewed all other materials cited herein.

7. I have also relied upon various legal principles (as explained to me by VWGoA’s counsel) in formulating my opinions. My understanding of these

principles were summarized in my original declaration and remain unchanged for the purposes of this declaration.

8. I am being compensated by VWGoA at my standard hourly rate of \$450 dollars per hour for the time I spend in connection with this proceeding. My compensation is not dependent in any way on the substance of my opinions or in the outcome of this proceeding.

9. In his declaration, Mr. Lanning makes several statements regarding the '701 patent, the prior art references, and the relevant technology at issue in this proceeding, which I believe to be inaccurate and misleading. My responses to these statements are detailed below.

II. Overview of Patent Owner Response

10. Based on my review, it is my opinion that Patent Owner has not shown that the challenged claims of the '701 patent are patentable.

11. Patent Owner's primary argument is that the references fail to disclose the claimed "*mobile device*" because the devices disclosed in the references do not "register with [nor are] able to directly communicate with the cellular network." POR, 13, 42, 49-50. It appears to me that this is the only element from the challenged independent claim that Patent Owner alleges to be missing from Grounds 1-2.

12. Patent Owner also argues that the references fail to disclose the claimed “*best signal*” because they do not disclose selection of a signal that “includes an analysis of the error rate in addition to the signal strength” (*id.*, 44), and argues that Gilhousen865 does not disclose the claimed “*movable base station configured to move relative to Earth*,” because Gilhousen865’s airplane does not move with traffic on “predetermined roads” (*id.*, 47-49), and that Gilhousen865 and Gilhousen390 do not disclose the claimed “*automotive vehicle*” because “*automotive vehicle*” is limited to an automobile (e.g., not an airplane). *Id.*, 51-52.¹

13. As I discuss in detail below, I disagree with these arguments for multiple reasons. First, I don’t read the claims to require “analysis of the error rate in addition to the signal strength,” “predetermined roads,” or an “automobile.” Second, it is my opinion that a POSA at the time of the ’701 patent would not have interpreted the claims in this manner. Nonetheless, I have been asked to provide my opinions as to whether and to what extent the art teaches these interpretations.

¹ I note that Patent Owner does not appear to have presented any arguments with respect to claims 31 and 33-35. Therefore, I frame my discussions below in the context of claims 10 and 15-18. However, my opinions regarding those claims are equally applicable to corresponding claims 31 and 33-35.

Based on my review, even if interpreted in the manner proposed by Patent Owner, the art still discloses and/or teaches the claims.

III. Claim Construction

14. I first turn to the area of claim construction. In my original declaration, submitted in support of VWGoA's Petition for *Inter Partes* Review, I set forth my understanding of claim construction—namely that, during an *inter partes* review, claims are to be construed in light of the specification as would be read by a person of ordinary skill in the relevant art at the time the application was filed, and that claim terms are given their ordinary and customary meaning as would be understood by a person of ordinary skill in the relevant art in the context of the entire disclosure. I believe, however, that both Patent Owner and Mr. Lanning have failed to properly construe and have violated certain well-established claim construction principles by improperly interpreting the scope of several claim limitations of the '701 patent.

15. Patent Owner proposes constructions for five claim terms: “*fixed port*,” “*configured to*,” “*transmit radio frequency signals to a mobile device corresponding to the received fixed port signals*,” “*mobile device*,” and “*automotive vehicle*.” Notably, Patent Owner also relies on a new interpretation of the term “*best signal*.” However, because Patent Owner does not expressly

construe this term, I address its meaning in the substantive discussion, below. *See infra*, Section IV.A.2.

16. First, it is my opinion that none of these terms require construction. Specifically, I have been instructed that claim terms in this proceeding should be given their ordinary and customary meaning as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. I am familiar with each of the above terms, both in the context of the '701 patent, and as used in the art generally. And it is my opinion that each of the above claim terms are clear on their face, and none have a specific meaning in the art beyond their ordinary meaning. Thus, a POSA would have understood the ordinary and customary meaning of all the above claim terms. Nonetheless, I have been asked to review and provide my opinion with respect to Patent Owner's proposed constructions of "*mobile device*" and "*automotive vehicle*," which I do below.

17. I have not been asked to provide my opinion with respect to Patent Owner's proposed constructions of "*fixed port*," "*configured to*,"² and "*transmit*

² Patent Owner's arguments relating to the "*configured to*" term are based on extraneous limitations that are not a part of the plain and ordinary meaning or Patent Owner's proposed construction for this term. Therefore, I specifically

radio frequency signals to a mobile device corresponding to the received fixed port signals,” because Patent Owner does not appear to base any of its patentability arguments on these constructions.

A. “Mobile Device”

18. Patent Owner proposes construing “*mobile device*” to mean “a device that must register with and be able to directly communicate with the cellular network.”³ POR, p. 13. Patent Owner argues that this is the “plain and ordinary meaning of the term.” *Id.* I disagree.

19. As I have already stated, I do not believe that any construction of the term “*mobile device*” is needed. As one could imagine, the term “mobile device” is

address Patent Owner’s arguments relating to the “*configured to*” term in Section IV.B.1, which relates specifically to my obviousness analysis for this term.

³ On page 42 of the POR, PO appears to add a third requirement of a “*mobile device*” as being “capable of being switched back and forth between either a direct connection with the fixed base station or a connection with a moving base station.” This additional requirement does not appear to form the basis of any argument, and is not part of PO’s proposed construction. Nonetheless, the applied references also disclose this additional function for the reason discussed in Sections IV.A.1 and IV.B.2 below. *See* EX1003, Denning Decl., ¶73.

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widely used throughout the industry of telecommunications, and cellular telecommunications in particular. And a POSA, as defined either by myself or Patent Owner's expert, Mr. Lanning, certainly would have understood the meaning of the term on its face.

20. And the claims of the '701 patent do not use the term "*mobile device*" in any unique way that would contradict its plain and ordinary meaning as would have been understood by a POSA. For example, Patent Owner argues that a "*mobile device*" must be able to register with or directly communicate with a cellular network. But the claims do not state this. Rather the opposite - the claims recite a "*movable base station*" that is configured to facilitate communications between the "*mobile device*" and the network.

21. The only functionality attributed to the "*mobile device*" by the independent claims of the '701 patent are the abilities to transmit and receive radio signals from/to the claimed "*movable base station*." In fact, I note that the challenged claims are not directed to a "*mobile device*." See, e.g., '701 patent, claims 10. Rather, the "*mobile device*" recited in the claims is ancillary to the claimed "*movable base station*." I understand that Mr. Lanning also acknowledged that the claims are not directed to the "*mobile device*" but are rather directed to the claimed "*movable base station*":

Q: Does the claim anywhere require that the mobile device be able to transmit signals to the moving base station?

A: Are you asking about the '023 patent in general or just the challenged claims?

Q: I'm asking about the challenged claims.

A: The challenged claims are all in regard to the moving base station or specifically an apparatus configured to move relative to the earth and what it's required to do. ***None of the claims are in regard to the mobile device.***

EX1039, 163:18-164:7.⁴

22. Specifically, claim 10 recites “*a transmitter configured to transmit radio frequency signals to a mobile device corresponding to the received fixed port signals.*” Claim 10 does not recite any specific functionality for the “*mobile device*” and does not describe any specific manner for the “*mobile device*” to receive or process received radio frequency signals. Similarly, claim 10 does not require that the “*mobile device*” have any specific functionality for bypassing the claimed “*movable base station*” to communicate directly with a network. In this manner, the “*mobile device*” is not a component of the “*movable base station*” and does not limit the functionality of the “*movable base station.*” Thus, providing a

⁴ All emphasis is added except where indicated.

limiting construction for “*mobile device*” would not provide any additional patentability to what is actually being claimed—the “*movable base station*”.

23. Moreover, the claims of the ’701 patent do not recite any registration process or requirement that the mobile device communicate directly with a cellular network. As I previously explained, the claims are directed to a “*movable base station*” or a movable base station that facilitates communications between the “*mobile device*” and a network. The “*mobile device*” recited in the claims receives and transmits signals from and to the claimed “*movable base station.*” The “*movable base station*” then receives and transmits signals from and to a base station or a “*fixed port.*” In view of this configuration, the claims explicitly recite the “*movable base station,*” not the “*mobile device,*” communicating with the fixed port. In this manner, the language of claims demonstrate why Mr. Lanning’s construction is incorrect.

24. Finding no support in the claims for Patent Owner’s proposed construction, I turn to the specification. But the specification of the ’701 patent also does not support Patent Owner’s construction. First, I note that the ’701 specification refers to a “mobile unit,” as opposed to a “*mobile device.*” Even presuming that these disclosures apply to the claimed “*mobile device,*” I still do not agree with Patent Owner’s proposed construction. For example, the portions of the specification Patent Owner relies upon to support its construction appear to be

mere embodiments, which is confirmed by other portions of that specification that Patent Owner appears to have overlooked, and which describe that the mobile unit does not communicate directly with the network.

25. For example, other embodiments of the '701 specification disclose that "the higher power level signal will overpower the lower level signal such that **the mobile unit does not receive communications from the fixed radio port** but only from the movable base station. In the reverse direction, a low level of signal is transmitted from the mobile units to the movable base station and a high-level signal is transmitted from the base station to the fixed radio ports, **thereby eliminating any direct communication from the mobile unit to the fixed radio port.**" EX1001, '701 Patent, 3:26-35. Additionally, the '701 specification discloses that "instead of having fixed and moving base stations as depicted in FIG. 1, slowly moving and rapidly moving units may be used." *Id.*, 4:46-52.

26. Therefore, I look lastly at the prosecution history of the '701 patent. Once again, I am unable to locate any support for Patent Owner's construction for "*mobile device*." Instead, it appears that Patent Owner argued for a broader construction during prosecution. Namely, during prosecution of related Appl. No. 09/401,584 (now U.S. Patent No. 7,221,904; I understand that the '701 patent is a continuation of this application), Patent Owner argued that "mobile units" include

“telephones, radio modems, or other types of radios.” EX1023, ’904 Pros. Hist., 0181.

27. In light of the above, I maintain that no specific construction of “*mobile device*” is needed. However, I have been asked to provide my opinion as to a proper construction nonetheless. Consistent with its general usage in the art, claims, and specification, this term should be construed in accordance with its ordinary and customary meaning to mean “a movable device capable of receiving and transmitting radio frequency signals.” This is consistent with the claims, which merely require that a moving base station transmitter can “*transmit radio frequency signals to a mobile device*” (claim 10) and that a moving base station receiver can “*receive mobile device signals from a mobile device*” (claim 1).

B. “Automotive Vehicle”

28. Patent Owner construes “*automotive vehicle*” to mean “automobile.” I disagree. First, it is my opinion that this phrase requires no explicit construction because it is commonly known. However, I have been asked to provide an opinion as to its specific meaning. As I describe in further detail below, it is my opinion that “*automotive vehicle*” should be construed in accordance with its plain and ordinary meaning to mean “a vehicle moving by means of its own power.” The reasons for this opinion, I have already set forth in my previous declaration. *See*

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EX1003, ¶¶182, 200, *citing* EX1033, 93 (defining “automotive” and “vehicle”).

Mr. Lanning declined to provide an analysis of this term. *See* EX2100, ¶¶45, 145.

29. Here, Patent Owner attempts to support its proposed construction by pointing to the specification, which states that “[t]he moving base stations 30 may be moved by means of a ... suitable conveying device which **may** include an automotive vehicle traveling on the roadway.” POR, 16. However, this language is not mandatory, but permissive. Therefore, this does not evidence that “[a]n ‘automotive vehicle’ **must** travel along the roadway.” *Id.*, 16-17. Accordingly, I do not interpret this statement as altering the well-known, and dictionary-defined, meaning of the term.

30. Patent Owner next argues that the prosecution history of ’701 patent supports its construction. During prosecution of the application, Applicant argued that “Charas discusses a repeater on a train and does not suggest automobiles.” EX2107, 0051. But this statement does not set forth a definition for “*automotive vehicle*.” And even if this statement did inform the meaning of “*automotive vehicle*” in some way, I still find it an insufficient statement to alter the well-known meaning of this common term.

31. Therefore, while I maintain that no construction of the term “*automotive vehicle*” is needed, if such a construction is deemed necessary, this

term should be construed in accordance with its ordinary and customary meaning to mean “a vehicle moving by means of its own power.” EX1003, ¶200.

IV. The References Disclose the Alleged Missing Elements.

A. Ground 1: Ito in view of Gardner.

1. Ito discloses “a mobile device.”

32. Ito discloses a portable device PSS (“mobile device”) that sends and receives radio frequency signals. *See* EX1005, 13:15-18, 11:65-12:1, FIG. 6 (annotated below). In particular, Ito explains that “the portable device PSS and the mobile base device MSS are mutually connected by way of a second radio channel having radio frequencies f_{TA} and f_{RA} ... available for telephone communication.” *Id.*, 11:65-12:1.

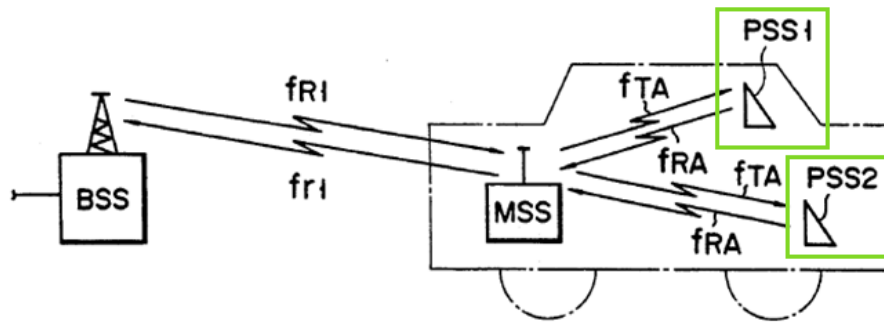


FIG. 6

EX1005, FIG. 6 (annotated).

I have also explained this functionality previously in paragraphs 124-125 in my original declaration. Therefore, Ito discloses the claimed “*mobile device*” under its plain and ordinary meaning—i.e., “a movable device capable of receiving and

transmitting radio signals.” *See* Denning Dec, ¶124. Mr. Lanning does not appear to rebut this argument.

33. I have also been asked to opine on whether the art discloses or otherwise teaches the claims when construed as proposed by Patent Owner. It is my opinion that Ito does so.

34. First, I note that Patent Owner appears to draw a distinction between the claimed “*mobile device*” and a “cordless telephone system” (*see, e.g.,* POR, 5: “The ’701 Invention is Not Directed Toward Cordless Phones”), and argues that Ito discloses the latter. *Id.*, 41. I disagree. Ito discloses its cordless phone system as a mere *alternative* embodiment: “Alternatively in a second possible application that uses a system according to the invention for a cordless telephone system” EX1005, 3:36-41. Ito’s disclosure is directed to more than cordless phone implementations. For example, Ito explains in the preceding paragraph that its “portable device” corresponds to a “portable radio telephone handset.” *Id.*, 3:17-23. A POSA would have understood that this “portable radio telephone” is a different type of mobile device that differs from a cordless phone. A “portable radio telephone” instead operates much like a conventional cellular telephone.

35. Ito further distinguishes its radio telephone from traditional cordless phones, stating that:

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It is a known fact that a conventional portable radio telephone handset arranged in a car normally needs to be **taken out of the car and placed somewhere outside the car ... in order to make it operable relative to a matching telephone main unit in the car.** A portable radio telephone handset of a system according to the invention, however, is not required to be placed outside the car nor does it need an adaptor to be put on it to become operable.

Id., 3:27-35. A device that is normally “taken out of the car” in order to be operable is different from a cordless phone. That is, cordless phones would have preferably operated in closer proximity to its corresponding telephone docking unit. Ito’s description of taking the “conventional portable radio telephone handset” out of the car—to allow for a better direct connection with a fixed base station—demonstrates that the portable radio telephone device differs from a cordless phone. Thus, a POSA would have understood that Ito’s portable radio telephone device is not limited to a cordless phone.

36. Patent Owner argues that Ito “does not disclose any ability of its portable device to register or directly communicate with a cellular network.” POR, 42-43. But Patent Owner’s argument overlooks key teachings in Ito. For example, Ito’s PSS (“*mobile device*”) includes a transmission system having a power amplifier (PA) 16 and an antenna 18. EX1005, 6:3-8. Ito also discloses that “radio transmission signals coming out from said power amplifier 16 are forwarded to the antenna 18, which sends them out **to a corresponding base station BSS.**”

EX1005, 6:32-35. Ito also discloses that the PSS includes a control system having

“an electric field strength sensor circuit 33, [which] senses the received field strength of the electric wave transmitted **from the base station BSS it belongs.**”

Id., 6:65-7:1. This sensor would be superfluous if Ito’s PSS only received signals from the mobile base device MSS. As discussed above, the purpose of having a received electric field strength sensor circuit in Ito’s PSS is to sense the signal strength of signals transmitted from the base station BSS. In my opinion, a POSA would have understood that Ito’s PSS needs to receive at least some signals directly from the base station BSS to perform the sensing function correctly, i.e., these signals cannot be retransmitted by an intermedia device, such as Ito’s mobile base station MSS. Any retransmission would change the strength of the signal and the result of the sensing would be incorrect. Therefore, Ito’s PSS is capable of directly communicating with its base station BSS, in addition to directly communicating with mobile base station MSS.

37. Further, a POSA would have understood that a mobile device that is capable of directly communicating with a base station is also able to register with the base station. For example, U.S. Patent No. 5,621,784 to Tiedemann explains that “[a] mobile station uses a process called registration to inform the cellular system where the mobile station is located. Well known methods of registration in the art include registration at power up, and registration upon entering each new

base station coverage area, among many others.” EX1043, Tiedemann784, 1:51-

56. Therefore, a mobile station needs to perform registration to establish or maintain connection with the cellular system. A POSA would have understood that base stations provide the connection from the mobile station to the cellular network. Thus, the registration is a prerequisite for communications between the mobile station and the base station, including direct communications.

38. Even if Ito does not explicitly disclose that its PSS can directly communicate and register with the cellular network, a POSA would have recognized Ito as implying this functionality. For example, Ito discloses its invention in the context of known “cellular type automobile telephone system[s].” EX1005, 1:8-17. Ito also discloses that its MSS can designate a transmission frequency and time slot allocation to the PSS using the control channel. *Id.*, 11:39-44. This is also indicative of a cellular communication system. For example, Scourias discloses that a GSM system employs control channel for frequency allocations. EX1013, Scourias, 8-9. A POSA would have understood that a GSM system is a typical cellular system. Thus, a POSA would have understood that Ito’s system could support cellular communications, which would necessarily include direct communication and registration with the cellular network.

39. Further, Mr. Lanning appears to have confirmed that the claimed “*mobile device*” is the same as that discussed in the Background section of the ’701

patent, which makes sense to me. *See* EX1001, 11:3-11; *see generally* EX1039, 104:12-116:19. Mr. Lanning relies on the Background disclosure to support Patent Owner’s proposed construction (EX2100, ¶52), and acknowledges that these mobile devices operate in a “conventional manner” (*id.*, ¶49). This further suggests that a POSA would have known that the claimed “*mobile device*” is not new, and that such a conventional mobile device could be used in Ito’s system. As discussed above, Ito’s portable radio telephone is capable of registering with and directly communicating with the base station. Therefore, a POSA would have understood Ito as disclosing the “*mobile device*” of claim 10 even under Patent Owner’s proposed construction.

2. Gardner discloses selecting a “best signal.”

40. I maintain that Gardner discloses selecting a “*best signal*,” for at least the reasons I discussed in my previous declaration. *See* EX1003, ¶¶126-28. Here, however, Patent Owner argues that Gardner fails to disclose this limitation because “*best signal*” in the context of the ’701 Patent “includes an analysis of the error rate in addition to the signal strength.” POR, 46.

41. First, I note that Patent Owner’s reliance on the specification for this limitation appears to be misplaced. *Id.* Specifically, the cited portion of the specification (column 10, lines 57-62) is unrelated to the claim limitation in question. Claim 15 recites that the “*movable base station*” of claim 10 further

includes a controller configured to “*compare the received fixed port signals ... and to select a best signal.*” EX1001, claim 15. Regardless of the specific purpose for this limitation, it is clearly being performed by the movable base station. Mr. Lanning appears to have confirmed this understanding during his deposition. EX1040, 420:9-421:6.

42. Meanwhile, the portion of the '701 patent cited by Patent Owner clearly relates to handoff decision-making *at the mobile device*. I reproduce that citation in full below:

The procedures for determining whether a mobile unit is to be served by a fixed base station or a moving base station are the same procedures as described earlier herein in determining which moving base station is selected to serve a mobile unit, i.e., based on signal strength and error rate. Thus, when a call involving a mobile unit is initiated or when it is determined that a handoff should occur, the mobile unit may be handed from a moving station to a fixed station, or vice versa. **Each mobile unit monitors pilot signals from fixed and moving base stations and synchronizes to the base station providing the best signal.**

EX1001, 10:57-67.

43. Thus, Patent Owner's lone support does not relate to the claimed limitation (i.e., the movable base station selecting a best signal from multiple signals transmitted by a single fixed port), but rather to functions carried out by a

mobile device in determining whether to handoff between different fixed ports or base stations. Therefore, this citation does not support Patent Owner's interpretation of "*best signal*."

44. Nonetheless, I have been asked to opine on whether Gardner discloses this limitation in the event that the Board adopts Patent Owner's implied construction of "*best signal*." Based on my review, it is my opinion that Gardner still renders this limitation obvious.

45. Gardner discloses that "[t]here are many well known schemes for making use of the signals from the two antennas." EX1006, 1:25-26. In one such scheme, Gardner discloses "maximal ratio coherent combining" in which signals from two antennas are "aligned in phase, **weighted with gains proportional to their signal voltage to noise power ratios**, and summed." *Id.*, 1:32-34. A POSA would have understood that there is a 1-to-1 mapping between signal-to-noise ratio and error rate for a given modulation and coding. In other words, each value of error rate corresponds to a specific signal-to-noise ratio, and vice versa. *See, e.g.*, EX1047, Pyndiah, 1042 (Figures 4-6 graphing the one-to-one correspondence between bit error rate (BER) and signal-to-noise ratio (SNR)). For example, U.S. Patent No. 6,292,651 to Dapper explains that "the signal to noise ratio estimate is directly related to a probable bit error rate, such probable bit error rate can be utilized for channel monitoring in order to determine whether a bad or good

channel exists.” EX1044, Dapper, 77:40-44. Therefore, it would have been obvious to a POSA that Gardner’s analysis of signal voltage to noise power ratio includes an implied analysis of the relative error rate within the signal transmission.

46. Additionally, Gardner discloses analyzing signals using coherent demodulation schemes, which analyze symbol errors of the signal. EX1006, 1:28-41. Gardner explicitly discloses that these schemes analyze the symbol errors of the signal. *See id.*, Appendix 1. Therefore, Gardner’s signal analysis includes tracking a number of symbol errors. A POSA would have understood that the error rate is a ratio between the number of symbol errors and a number of total symbols received. Thus, it would have been obvious to a POSA to consider error rates of received signals based on Gardner’s teachings.

47. In addition, I disagree with Mr. Lanning’s statement that “the strongest signal may not be the best signal received by the mobile phone, as Mr. Denning opines, because the strongest received signal may not be coming from the correct cellular network operator or the strongest signal may have some type of distortion that would cause errors in the data being received.” EX2100, ¶137. First, claim 15 does not require the moving base station to select signals between correct and incorrect base stations. Claim 15 depends from claim 10, which recites “*a receiver configured to receive fixed port signals from a fixed port.*” Therefore, claim 15 merely requires selecting a best signal among signals received from a

single fixed port. Thus, all signals analyzed are from the same fixed port, including the best received signal that is selected. Second, Gardner discloses analysis of distortion of the signals received. For example, Gardner discloses that “[t]he phase of the down converted signal for each antenna will depend not only on the information bearing portion of the phase of the signal, but also the contribution due to phase changes caused by the channel, the difference in frequency between the local carrier oscillator 2 the transmitter oscillator, the contribution of intersymbol interference, and receiver front end noise and other interference.” EX1006, 2:31-38. Therefore, a POSA would have understood that signals received from each antenna may have different phase distortions and selecting the strongest signal includes consideration of such phase distortions.

B. Ground 2: Gilhousen865 and Gilhousen390.

1. Gilhousen865 discloses “*A movable base station configured to move relative to Earth.*”

48. As discussed above, Patent Owner argues that Gilhousen865 does not disclose “*a movable base station configured to move relative to Earth*” based on Patent Owner’s proposed construction of “*configured to.*” Namely, it is my understanding that Patent Owner proposes construing “*configured to*” to mean “constructed to move with the traffic at a rate of speed which is comparable to the speed of the traffic.” POR, 47-48. Patent Owner argues that Gilhousen865’s airborne apparatus fails to meet this requirement. *Id.*, 47-49.

49. Specifically, Patent Owner argues that Gilhousen865's airborne apparatus fails to meet the "*configured to*" limitation because an airplane "does not move with traffic as it is not bound to predetermined roads." *Id.*, 48-49. I disagree.

50. First, I note that the language "bound to predetermined roads" does not appear in the claims or in Patent Owner's proposed construction for "*configured to*." Second, it appears that the only support provided by Patent Owner for the addition of "bound to predetermined roads" into the claim is Mr. Lanning's declaration. But, based on my review, Mr. Lanning's declaration never states or provides any other support for the contention that "traffic" is limited to predetermined roads.

51. Further, in my opinion, the injection of "bound to predetermined roads" into the meaning of "traffic" is inconsistent with the '701 specification, which discloses embodiments where the movable base station moves relative to other (e.g., non-road) types of traffic, such as "pedestrian traffic." *See, e.g.*, EX1001, 2:40-43, 3:15-19, 4:46-49.

52. Further still, in my opinion, the requirement of "predetermined roads" contradicts the ordinary and customary meaning of the term "traffic." "Traffic" is not a term of art, and does not appear to have any specific meaning in the context of the '701 patent, as evidenced by the various types of traffic described in the '701 patent. And this term had a common and well-known understanding at the

time of the '701 patent. For example, dictionaries at the time defined "traffic" as "vehicles moving on a public highway, **in the air**, or at sea." EX1036, Oxford Desk Dictionary, 611. Gilhousen865's airplane certainly meets this definition. And a POSA would have understood that Gilhousen865's airplane is a vehicle moving in the air. Therefore, it is my opinion that Patent Owner's proposed interpretation of "traffic" is incorrect.

53. Nonetheless, I have been asked to opine on whether the art discloses or teaches this limitation as Patent Owner has construed it in the event that Patent Owner's proposed construction is adopted. Based on my review, it is my opinion that this limitation still would have been obvious over Gilhousen865.

54. First, airplanes often travel along predetermined roads, such as during taxi, takeoff and landing. *See, e.g.*, EX1045, FAA Runway Safety, 35 (explaining that "roadways bounded by 'zipper' markings are also used by aircraft"); *see also* 32-39 (generally showing airfield boundaries for use by airplanes). Second, Gilhousen865's teachings are not unique to an airplane. Rather, Gilhousen865 discloses radio telephones on board a vehicle that communicates with a base station via a moving base station system having an antenna located on the outside of the vehicle. Gilhousen865 further discloses that "[t]he airborne communication system of the present invention operates in a similar way to the ground based CDMA radiotelephone system discussed in Gilhousen et al." EX1009,

Gilhousen865, 3:11-13. A POSA would have understood that Gilhousen865's airborne communication system is not limited to the airplane application. In fact, Gilhousen865 discloses that the airborne system functions substantially the same as a ground-based system: "This upward radiation forms a cell that is elevated above the ground allowing the airborne radiotelephone to travel through the elevated cells in the same manner that a mobile radiotelephone on the ground travels through terrestrial cells" Gilhousen865, 2:37-41. Thus, a POSA would have recognized Gilhousen865's teachings to be equally applicable to other vehicles, including automobiles, and to have provided the same or similar benefits as the plane-based embodiments of Gilhousen865. A POSA would have understood that Gilhousen865's airborne communication system can be installed in other vehicles without changing its structure and design. For example, the airborne communication system can be installed in the trunk of an automobile and connected with an external antenna installed on the roof of the automobile. Therefore, a POSA would have found it obvious to apply Gilhousen865's teachings to an automobile-based system for use on "predetermined roads."

2. Gilhousen865 discloses "a mobile device."

55. I maintain that Gilhousen865 discloses the claimed "*mobile device*" under its ordinary and customary meaning. EX1003, ¶¶172-73. For example, Gilhousen865 discloses that its radiotelephone is both movable and that it sends

and receives radiofrequency signals. *See, e.g.*, EX1009, 2:37-41, 2:27-31, 2:45-52, 3:38-40. Mr. Lanning does not appear to rebut this argument.

56. I also have been asked to opine on whether Gilhousen865 discloses this limitation in the event that the Board adopts Patent Owner’s construction. In my opinion, Gilhousen865 would still disclose this limitation.

57. Patent Owner argues that “[w]hile Gilhousen865 does disclose radiotelephones, Gilhousen865 does not disclose a transmitter configured to transmit radio frequency signals to **a radiotelephone that registers with or is capable of directly communicating with the cellular network** as required by the limitation of a ‘mobile device’ in the context of the entire ’701 patent.” POR, 49-50. However, this argument overlooks key disclosures in Gilhousen865.

58. Gilhousen865 discloses that its radiotelephone registers with a base station: “This enables the radiotelephones to search for the strongest pilot signal of the next cell and **register with that base station.**” EX1009, 3:57-59; *see also id.*, Abstract, 3:3-10, 4:1-5. Mr. Lanning confirms this understanding, stating that “I would say as far as the network is concerned...the radiotelephone is registered with the network...” EX1040, 334:12-335:5; *see also id.*, 343:5-9. Additionally, Gilhousen865 discloses that traditional aircraft radiotelephones “connect[] with one of 70-80 radiotelephone base stations, also known as cells, **on the ground.**” The cell to which it connects depends on to which base station the aircraft is

closest when the call is initiated.” EX1009, 1:17-23. Thus, these radiotelephones are capable of directly communicating with a base station. Gilhousen865 further indicates that similar radiotelephones are used within its “airborne based subsystem,” employing “a CDMA-type radiotelephone (205) to communicate with a radiotelephone signal repeater (210).” *Id.*, 2:45-48; *see also* EX1009, 3:3-14 (“The airborne communications system of the present invention operates in a similar way to the **ground based** CDMA radiotelephone system ...”). In my opinion, these disclosures satisfy Patent Owner’s proposed construction.

59. I further note that Mr. Lanning does not define the bounds of what he refers to as the “cellular network.” Gilhousen865’s repeater/airborne base station is effectively part of this “cellular network” because it communicates with the fixed base stations on the ground. Indeed, the use of cellular repeaters for facilitating communication within a cellular network (which would be considered part of the “cellular network”) was widely known prior to the ’701 patent. *See, e.g.*, EX1048, Jakubowski. And there is no dispute that Gilhousen865’s radiotelephones register and communicate with the airborne base station. EX1009, 4:1-2 (“Once the radiotelephone is registered with the aircraft base station ...”).

60. Additionally, even if Gilhousen865 does not explicitly disclose that its radiotelephones register and directly communicate with the cellular network, a POSA would have recognized Gilhousen865 as implying this functionality. For

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example, Gilhousen865 discloses that the radiotelephone operates using the Telecommunications Industries Association/Electronic Industries Association Interim Standard 95 (TIA/EIA/IS-95), the first CDMA cellular telephone standard, that enabled registration and direct communication with the cellular network. *Id.*, 2:65-3:2. As disclosed in ITU, “CDMA operation is based upon **TIA/EIA IS-95-A for 800 MHz operation (cellular)** and ANSI J-STD-008 for 1.8 GHz operation (PCS).” EX1038, ITU, 26. Therefore, a POSA would have understood that TIA/EIA/IS-95 is used in CDMA based cellular system. Additionally, Gilhousen865 discloses its system is a CDMA cellular radiotelephone system (EX1009, 2:13-15), which allows for communications with “ground based **cellular** radio systems” (*id.*, Abstract), having antennas that are “identical to typical cell site antennas that are well known to one skilled in the art” (*id.*, 2:34-37). Thus, a POSA would have understood that Gilhousen865’s system could support cellular communications, which would necessarily include direct communication and registration with the cellular network. In view of the above, it is my opinion that a TIA/EIA/IS-95 standard based radiophone operating in a CDMA cellular radiotelephone system, such as the system disclosed in Gilhousen865, satisfies requirements of the “*mobile device*” described in ’701 patent.

3. Gilhousen865 discloses “automotive vehicle”

61. I maintain that Gilhousen865 discloses the claimed “*automotive vehicle*” under its ordinary and customary meaning for at least the reasons I set forth in my previous declaration. EX1003, ¶181-82. Patent Owner argues that Gilhousen865 does not disclose “*wherein the vehicle is an automotive vehicle*,” of claim 18. Patent Owner’s argument is based on its construction of “*automotive vehicle*,” which Patent Owner defines as “automobile.” POR, 51. As demonstrated above, it is my opinion that this construction is erroneous. Nonetheless, I have been asked to opine on whether Gilhousen865 discloses this limitation. Based on my review, it is my opinion that Gilhousen865 still would have rendered obvious this limitation.

62. As discussed above, Gilhousen865’s teachings are not unique to an airplane. Rather, Gilhousen865 discloses radio telephones on board a moving vehicle that communicate with a base station via a moving base station system having an antenna located on the outside of the vehicle. Gilhousen865 further discloses that “[T]he airborne communication system of the present invention operates in a similar way to the ground based CDMA radiotelephone system discussed in Gilhousen et al.” EX1009, 3:11-13. This concept is equally applicable to other vehicles, including automobiles, and would have provided the same or similar benefits as the airplane-based system of Gilhousen865. A POSA would

have understood that Gilhousen865's airborne communication system can be installed in other vehicles without changing its structure and design. For example, the airborne communication system can be installed in the trunk of an automobile and connects with an external antenna installed on the roof the automobile. Therefore, a POSA would have found it obvious to apply Gilhousen865's teachings to an automobile-based system.

63. As a side note, Patent Owner argues that I do not appreciate any distinction between the "*vehicle*" of claim 17 and the "*automotive vehicle*" of claim 18, in violation of claim differentiation. POR, 51-52. I believe this to be incorrect. According to my reading of the claims, claims 17 and 18 define a genus/species relationship between the terms "*vehicle*" and "*automotive vehicle*" because claim 18 recites that "*the vehicle [(of claim 17)] is an automotive vehicle.*" Thus, to satisfy the "*automotive vehicle*" limitation of claim 18, the device must also, **by definition**, be a "*vehicle*," as required by claim 17. I was fully aware of claim differentiation when I prepared my previous declaration, and I understood that many non-automotive vehicles existed (e.g., wagons, strollers, trailers, bicycles, etc.) that would satisfy claim 17 without satisfying claim 18. But Gilhousen865's airplane satisfies both.

V. The Petition Has Demonstrated a Motivation to Combine the Asserted Prior Art References.

A. Motivation to combine Gilhousen865 and Gilhousen390

64. Patent Owner asserts that Gilhousen865's airborne system cannot properly be modified with CDMA (as taught by Gilhousen390) because Gilhousen865 will be unable to perform power control of the CDMA system due to the speed of the aircraft. POR, 38-41. But Patent Owner's argument overlooks that Gilhousen865's communication system *is* a CDMA communication system that uses a "CDMA-type radiotelephone" EX1009, 2:13-15; 2:46-52. As such, Gilhousen865's CDMA communication system would have considered the power control and other features of CDMA systems to operate in its preferred environment – on a plane.

65. I further note that Patent Owner's argument appears to be based on a presumed rate of speed of an airplane (e.g., "500 miles-per-hour")⁵. POR, 39. This speed seems significantly exaggerated to me. Gilhousen865 discloses that the airborne based subsystem could be "in a small aircraft." EX1009, 2:56-59. Mr. Lanning testified that a Cessna was an example of one such small aircraft

⁵ Based on my experience, CDMA can be applied to device with high moving speed. For example, CDMA is implemented in GPS satellites, which could move at a speed of a couple of thousand miles per hours.

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contemplated by Gilhousen865. EX1040, 378:2-5. I have reviewed a document from before the earliest filing date of the '701 patent suggesting that a small aircraft, such as a Cessna, available around the time of the '701 patent were capable of far lower speeds (e.g., "31 knots" (~36 MPH)) than suggested by Patent Owner. *See* EX1037, Cessna, 0069. This speed is even less than the "50 MPH" average speed of a vehicle deemed acceptable by Mr. Lanning. EX2100, ¶¶107, 121-22. Thus, Gilhousen865, covers at least some types of airplanes that would not be subject to any of the compatibility issues alleged by Patent Owner.

66. In any event, I think that the inability to effectively use power control does not eliminate the benefits of Gilhousen390's diversity techniques. For example, Gilhousen390 discloses that because multiple received "signals will typically exhibit independence in multipath fading, i.e., they usually do not fade together, the outputs of the two receivers can be diversity combined. Therefore a loss in performance only occurs when both receivers experience fades at the same time." EX1006, 5:26-31. That is, regardless of the strength of the signals received, diversity combining of multiple signals allows for a reduction in the effects of fading. *Pet.*, 52-55. Therefore, a POSA would have been motivated to combine Gilhousen390's diversity receivers with Gilhousen865's airborne radio system.

67. In addition, Mr. Lanning's states that "it is my opinion that [Klein Gilhousen] understood there were significant differences between his invention for

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a wireless system for ground based vehicles in Gilhousen390 and his invention for a wireless system for airborne planes in Gilhousen865.” EX2100, ¶109. I think this statement is misleading. Gilhousen865 cites to U.S. Patent No. 5,289,527 to Tiedemann (“Tiedemann527”) in multiple places to explain the registration process and hand-off process. EX1009, 3:22-24, 3:52-55. Tiedemann527 discloses a “vehicle mounted unit” and “vehicular traffic theory.” EX1046, Tiedemann527, 1:17-20, 3:31-46. Therefore, Klein Gilhousen understood that Gilhousen865’s system is compatible with a wireless system for ground based vehicles, such as Gilhousen390’s wireless system. A POSA would have been motivated to combine Gilhousen865 and Gilhousen390 since Gilhousen865 cites to the Tiedemann527, which discloses a wireless system for ground based vehicles.

VI. Conclusion

68. As I have set forth above, it is my opinion that claims 10, 15-18, 31 and 33-35 of the '701 patent remain unpatentable for the reasons I set forth in my previous declaration. It is my further opinion that, even if the claims are construed as Mr. Lanning has proposed, claims 10, 15-18, 31 and 33-35 of the '701 patent remain obvious over the asserted references.

69. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed this 26th day of June in Anderson, South Carolina.

Respectfully submitted,



Scott A. Denning