UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLKSWAGEN GROUP OF AMERICA, INC.,
Petitioner,

v.

NEO WIRELESS LLC,
Patent Owner.

Case IPR2023-00426
Patent 8,467,366

EXHIBIT 2001
DECLARATION OF WILLIAM P. ALBERTH JR.

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I. INTRODUCTION

1. My name is William P. Alberth Jr. I am an expert in mobile telecommunications and wireless technology. As further detailed below and exhibited in my *curriculum vitae* attached as Exhibit 2002, I have over 25 years of experience in the design, development, implementation, and manufacturing of mobile telephones, smartphones, and other electronic equipment in addition to being an inventor on over 100 patents, including those related to telecommunications and wireless communications.

2. I have been retained as an expert witness to provide my independent opinion in regard to the matters at issue in *inter partes* review of U.S. Patent No. 8,467,366 ("the '366 patent") in IPR2023-00426. I have been retained by Neo Wireless LLC ("Neo"), the Patent Owner in the above proceedings. The Petitioner is Volkswagen Group of American Inc. ("VW").

3. For my work on this case, I am being compensated for my time at my typical consulting rate of $200 per hour. I am also being reimbursed for expenses that I incur during the course of this work. My compensation does not depend on the substance of my opinions or the outcome of any issues in this case.

4. My analysis of the materials produced in this matter is ongoing and I will continue to review any new material as it is provided. This declaration

represents only those opinions I have formed to date. I reserve the right to amend or supplement my opinions based on additional documents or evidence I am presented, including without limitation any arguments or expert declarations advanced by VW in this case.

II. QUALIFICATIONS

5. I am qualified to be an expert witness in this matter as I possess the requisite knowledge, skill, experience, training and education relating to the subject matter covered by the asserted patents.

6. In summary, I have over 25 years of experience in the design, development, implementation, and manufacturing of mobile telephones, smartphones, and other electronic equipment. The majority of my career was spent at Motorola where my final role was serving as the Chief Technology Officer for Motorola Mobile Devices. I held that position from 2007 until August 2012, and in that role, I led the development of differentiating technology that was integrated into Motorola's commercial mobile telephone products.

7. During the early stages of my career with Motorola (between 1987 and 2006, covering the Priority Dates of the '366 patent) I was employed as an engineer, working on developing cutting-edge chipsets to enable cellular devices, and in the development of many products that changed the way people

communicated, including the development of the Motorola MicroTAC, StarTAC and RAZR mobile telephones. I worked on or directed work on evaluating transmitter technologies and architectures to mitigate the effects of PAPR (Peak to Average Power Ratio) on the current drain of the devices. Some of the techniques evaluated include for example: pre-distortion; envelope following; EER (Envelope Elimination and Restoration); and Adaptive biasing.

8. My educational background includes a B.S. in Electrical Engineering from the University of Illinois Urbana-Champaign (1985), and a M.S. in Electrical Engineering from Illinois Institute of Technology (1992).

9. I am inventor or co-inventor on over 100 patents issued or pending, including patents related to my work on transmitter architectures involved for wireless communications.

10. In forming my opinions here, I am relying on my education and experience, including my over 25 years of experience in a variety of technologies and industries related to various wireless communications systems.

11. Additional information concerning my background, qualifications, publications, conferences, honors, and awards are described in my Curriculum Vitae, a copy of which is attached with this Report as Exhibit 2002.

III. LEGAL STANDARDS

12. I am not a lawyer, and I do not intend to offer any opinions as to the interpretation of the law. When considering the '366 patent and stating my opinions, I rely on the following legal standards as described to me by the attorneys for Neo Wireless.

A. Priority Date Of Patent.

13. I understand that the analysis of alleged obviousness of the Patent should be performed from the perspective of a POSITA as of the priority date of the Patent. Through a series of continuations, the Patent claims priority to March 9, 2004. My opinions in this matter are from the perspective of a POSITA as of that date; however, my opinions do not change if the priority date is slightly changed.

B. Level Of Ordinary Skill In The Art.

14. My opinions in this declaration are based on the understandings of a person of ordinary skill in the art, as of the time of the invention. I understand that the person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. By "relevant," I mean relevant to the challenged claim of the '366 patent.

15. I understand that various factors should be considered when determining the person of ordinary skill in the art in connection with a particular patent. I understand that these factors include, without limitation, the type of problems encountered in the art, the prior solutions to those problems found in the prior art references, the rapidity with which innovations are made, the sophistication of the technology, the level of education of active workers in the field, and my own experience working with those of skill in the art at the time of the invention.

16. I am readily familiar with the level of ordinary skill in the art as of the priority date of the Patent. My qualifications at that time far exceeded that of a POSITA, and I had worked with, as well as supervised, many POSITA's throughout my work in the field.

17. Dr. Min opines that a POSITA:

> would have a B.S. degree in electrical engineering, computer engineering, or computer science, or an equivalent field, as well as at least 3-5 years of academic or industry experience in mobile wireless communications, or comparable industry experience. A greater amount of education, e.g., a doctorate in electrical engineering, computer engineering, computer science or an equivalent field would also qualify as a POSA for the 366 patent in lieu of a B.S. degree. Experience could take the place of some formal training, as domain knowledge may be

> learned on the job. This description is approximate, and a higher level of education or skill might make up for less experience and vice versa.

Ex. 1003 [Cimini-Decl.] ¶ 42.

18. I disagree with Dr. Cimini's proposed level of ordinary skill. I also understand that Dr. Cimini's proposed POSITA exceeds the level of ordinary skill in the art adopted by the Board in an earlier proceeding where the Board found that the proper level of ordinary skill in the art is only a "Bachelor's degree in an academic area emphasizing electrical engineering or a similar discipline," and only "two years of experience in the field working with, teaching, or researching wireless communication networks." *Dell Inc. v. Neo Wireless LLC*, IPR2021-01480, Paper 11, 7 (PTAB, Mar., 16, 2022).

19. I substantially agree with the level of ordinary skill in the art adopted by the Board in IPR2021-01480. In 2004 many of the professionals working in the wireless communications space had only a couple years of experience after having graduated with an undergraduate degree in electrical engineering or a similar discipline. Mobile communications was a fast-growing field that necessarily attracted many newcomers to the field. Certainly it was uncommon for working professionals in the field to have doctorate degrees and such advanced education would be typical of someone with more than ordinary skill in the art. For example,

under Petitioner's construction, Carl Eklund who "chaired the MAC Task Group that developed the IEEE 802.16 medium access control protocol and served as a lead MAC editor of IEEE Standard 802.16-2001" (Ex. 2003 [Elkund] 10) would only be a person of ordinary skill since he obtained his Master's Degree in 1996, about five years prior to his role at the IEEE committee. Such a high definition of ordinary skill is clearly erroneous.

20. A POSITA in 2004 was typically involved in deploying and configuring wireless communication equipment to increase the reach of commercial wireless networks, increase their capacity to handle more users, and also allow for the deployment of new applications requiring more bandwidth. A POSITA would not have been required to design a wireless system from the ground up. This is because many important parameters and design choices had already been made by standards setting committees. Thus, a POSITA would have had enough knowledge of the technology to understand and deploy equipment adhering to these technical specifications but would have a very limited ability to change the fundamental specifications of the network.

21. Based on my experience, education, and training, as of March 2004, I met the definition of a POSITA adopted by the Board in IPR2021-01480. My qualifications at that time far exceeded that of a POSITA, and I had worked with,

as well as supervised, many POSITA's throughout my work in the field. My opinions concerning the '366 Patent claims and the prior art are from the perspective of a POSITA, as set forth above.

22. As further discussed below, my opinions as stated in this declaration are valid even if the Board adopts a slightly different level of ordinary skill in the art.

C. Claim Construction.

23. I understand that claims in a patent-at-issue in an IPR are generally interpreted according to the district court-type claim construction.

24. I further understand that claim terms are interpreted as they would have been interpreted by a person of ordinary skill in the art at the time of the invention, in light of the specification and the patent's prosecution history in the patent office.

D. Obviousness Legal Standard.

25. I understand that a patent claim is unpatentable if the claimed invention would have been obvious to a person of ordinary skill in the art at the time of the invention.

26. I understand that an obviousness analysis involves comparing a claim to the prior art to determine whether the claimed invention would have been

obvious to a person of ordinary skill in the art at the time of the invention in view of the prior art and in light of the general knowledge in the art as a whole. I also understand that obviousness is ultimately a legal conclusion based on underlying facts of four general types, all of which must be considered: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) any objective indicia of non-obviousness, including any praise of the invention. Objective indicia of non-obviousness may include, for example, commercial success of an embodiment, a long-felt need, skepticism, failure by others to find the solution provided by the claimed invention, copying by others of the subject matter of the claim invention, unexpected results of the claimed invention, acceptance of others and industry praise, and licensing of the patents.

27. I also understand that obviousness may be established under certain circumstances by combining or modifying the teachings of the prior art. However, I have been informed that a claim is not proved obvious merely by demonstrating that each of the elements was independently known in the prior art. I have been informed that many, if not all, inventions rely on building blocks already previously known, and claimed discoveries almost of necessity will likely be combinations of what is already known. I have been informed that it is important

to identify whether a reason existed at the time of the invention that would have motivated a person of ordinary skill in the art in the relevant field to combine the known elements in the way the claimed invention does. Specific teachings, suggestions, or motivations to combine any first prior art reference with a second prior art reference can be explicit or implicit, but must have existed before the date of purported invention. I understand that prior art references themselves may be one source of a specific teaching or suggestion to combine features of the prior art, but that such suggestions or motivations to combine art may come from the knowledge that a person of ordinary skill in the art would have had.

28. I understand that a reference may be relied upon for all that it teaches, including uses beyond its primary purpose, but also including teachings that lead away from the invention. I understand that a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, although the mere disclosure of alternative designs does not teach away.

29. I further understand that whether there is a reasonable expectation of success in combining references in a particular way is also relevant to the analysis.

30. I understand that it is improper to use hindsight to combine references or elements of references to reconstruct the invention using the claims as a guide.

My analysis of the prior art is made from the perspective of a person of ordinary skill in the art at the time of the invention.

31. I am not offering any legal opinions in this declaration nor am I qualified to do so. I only consider such legal standards in framing my opinions and conclusions as well as placing assertions made by Petitioner in the Petition into the proper context. Additionally, from a subject matter perspective, I understand that the petitioner always has the burden of persuasion regarding a challenge of patentability of an invention under an inter partes review.

IV. CLAIMS-AT-ISSUE

32. I understand that Petitioner has challenged claims 1-24 of the '366 Patent under four grounds, as summarized below (*see* Pet., 9):

Ground	Claims	35 U.S.C.	Prior Art
1	1-4, 6-20, 22-24	§103	Jeong, Suzuki
2	2-3, 5, 10-11, 21	§103	Jeong, Suzuki, Gibson
3	1, 4, 6-9, 12, 15-20, 22-24	§103	Koo, 802.16ab, Chayat, Suzuki
4	2-3, 5, 10-11, 13-14, 21	§103	Koo, 802.16ab, Chayat, Suzuki, Gibson

33. Of the challenged claims, only claims 1, 9, 17 and 22 are independent. In this declaration, I have only been asked to address arguments relating to the

independent claims and, therefore, I do not address ground 2 and 4 of the Petition, which exclusively challenges certain dependent claims.

34. Furthermore, for the purposes of this declaration, I will discuss the relevant patentability arguments with regards to independent Claim 1 only. Independent challenged Claims 9, 17 and 22 recite substantially corresponding limitations, and the arguments I discuss in connection with claim 1 equally apply to those other independent claims.

V. OPINIONS

A. Petitioner's Grounds 1.

35. Petitioner's grounds 1 fails for two separate reasons, as I will discuss below.

1. Petitioner Does Not Show That The POSITA Would Have Been Motivated To Modify Jeong In View Of Suzuki To Utilize "Mobile Stations" With A Reasonable Expectation Of Success.

36. Claim limitation 1.3 recites a "mobile station" that is in communication with the base stations and performs various functions. Ex. 1001 ['366 Patent] 7:18 ("identifying the mobile station"). Independent claims 9, 17 and 22 recite materially corresponding limitations. *Id*., 8:3 ("identifying a mobile station"); 8:50-51 ("identifying the mobile station"); 9:16-22 ("a first mobile station" and "a second mobile station"). Petitioner relies on its discussion of

limitation 1.3 in connection with the corresponding limitations of the other independent claims. Pet., 33-34.

37. Petitioner and Dr. Cimini both note that Jeong does not disclose mobile stations. Pet., 25; Ex. 1003 [Cimini-Decl.] ¶ 75. Instead, Petitioner relies on modifying Jeong in view of Suzuki to use "a mobile station (as disclosed by Suzuki) in Jeong's system or to modify Jeong's subscriber stations to be mobile, because mobile communication systems, including mobile stations, were well-known by March 2004." Pet., 25. As I will explain below, it is my opinion that Petitioner has not shown why the POSITA either would have been motivated or had a reasonable expectation of success to "use a mobile station … in Jeong's system or to modify Jeong's subscriber stations to be mobile." Pet., 25. Instead, the evidence, including scholarly articles, establishes that the IEEE 802.16ab standard implemented by Jeong was designed for stationary users, and could not support mobile users until at least 2005, a year after the Patent's priority date of March 9, 2004.

38. Dr. Cimini correctly observes that Jeong does not disclose mobile stations. Ex. 1003 [Cimini-Decl.] ¶ 75. This is because Jeong discloses a specific method for allocating ranging interval and sub-channel in the context of a "point-to-multipoint broadband wireless access" system based on the IEEE 802.16ab

standard. Ex. 1008 [Jeong] 0003 ("***In IEEE 802.16ab***, OFDMA wireless communication system is defined such that data can be transmitted … using a microwave frequency band between 2 GHz and 11Gz."). Jeong explains that one of the "benefits of [its] invention" is that "there is ***no need to change the subcarrier allocation algorithm for data and pilot of the current IEEE802.16ab standard*** for data transmission and reception." *Id*., 0011.

39. In accord, Jeong repeatedly references aspects of the standard in its embodiments. For example, it explains that in its method, the ranging code is generated "by a Pseudo Random Binary Sequence ***("PRBS") generator (not shown) described in section 8.3.5.3.4.3.1 of IEEE 802.16ab/01r2*** into bit length of 159 bits."). *Id*., 0008; *see also id*., ("***Since this method uses the carrier allocation method of the existing TDD mode OFDMA wireless communication system as it is***, it is compatible with the uplink pilot and data carrier allocation method …."); ("***the ranging code not only uses the existing PRBS generation code as it is*** ….").

40. As another example, Jeong first explains the two schemes by which the IEEE 802.16ab standard assigns ranging subchannels, and proceeds to propose its invention for the second scheme. First, Jeong explains, "[r]eferring to FIG. 1, two 'sub-channels' among the 'sub-channels' composed of 53 carriers are always

set as ranging sub-channels ….” Ex. 1008 [Jeong] 0004. Jeong’s Fig. 1 then shows the two highest frequency sub-channels assigned as ranging subchannels. *Id*., Fig. 1. IEEE 802.16ab describes the exact same arrangement for its second scheme of assigning ranging subchannels, and, in fact, IEEE 802.16ab Fig. 158 is substantively identical to Jeong’s Fig. 1. Ex. 1012 [802.16ab] 0086-0087.

41. Jeong then describes the second scheme of assigning ranging sub-channels, explaining that “[a]s shown in FIG. 2, a ranging signal section for controlling accurate time offset and transmission power and a signal section for data transmission are temporally separated, so that only ranging information is received in the reception interval of the ranging signal.” Ex. 1008 [Jeong] 0004. Again, IEEE 802.16ab describes the exact same arrangement for its first scheme of assigning ranging subchannels, and, in fact, IEEE 802.16ab Fig. 157 is substantively identical to Jeong’s Fig. 2. Ex. 1012 [802.16ab] 0086-0087. IEEE 802.16ab refers to this scheme as the “TDD mode,” where TDD stands for time division duplexing. *Id*.

42. Jeong then explains that its method is for the TDD mode (the second option just explained) in the 2k mode of the IEEE 802.16ab standard. Ex. 1008 [Jeong] 0004 (“an object of the present invention … reducing the ICI between the ranging signals ***in the TDD mode*** OFDMA wireless communication system.”);

0008 (“First, as the first embodiment, assuming a 2K mode OFDMA wireless communication system …”); 0008-0009 (discussing other embodiments assuming the 2k mode); *see also* Ex. 1012 [802.16ab] 0200 (Table 218, 2k mode).

43. It was well-known in the field and to a POSITA that the IEEE 802.16ab standard (and its predecessors 802.16 and 802.16a) were directed exclusively at stationary systems and did not support mobile users. The title of standard itself states that it is the “Standard Air Interface ***for Fixed Broadband Wireless Access Systems***,” not for mobile systems. Ex. 1012 [802.16ab] 0001 (Title).

44. This is also readily confirmed by various literature in the field, such as Ex. 2003 [Eklund], which was co-authored by Carl Eklund, chair of the MAC task group that developed the IEEE 802.16 medium access protocol, and Roger Marks, chair of the IEEE 802.16 working group on broadband wireless access. Ex. 2003 [Eklund] 107 (Biographies). Eklund provides a technical overview of the IEEE 802.16 standard. It explains that “[t]he broadband wireless access industry,” including the IEEE 802.16 standard, “provides high-rate network connections to ***stationary sites***.” Ex. 2003 [Eklund] 98 (Abstract). Eklund further explains the purpose of the IEEE 802.16 standard at the time, which did not require mobile users. The IEEE 802.16 standard provided network access to buildings through

exterior antennas installed on the buildings as an alternative to cable access networks to provide the last-mile connection between the buildings and the larger metropolitan network infrastructure:

> As currently defined through IEEE Standard 802.16, a wireless MAN provides network access to buildings through exterior antennas communicating with central radio base stations (BSs). The wireless MAN offers an alternative to cabled access networks, such as fiber optic links, coaxial systems using cable modems, and digital subscriber line (DSL) links.

Ex. 2003 [Eklund] 98. WirelessMAN™ referenced in Eklund refers to the air interface for the IEEE 802.16, and stands for Wireless Metropolitan Area Networks. *Accord*, Ex. 1012 [802.16ab] 0001 (Local and Metropolitan Area Networks).

45. Once the building was connected to the larger metropolitan network through 802.16, the individual users inside the building could access the network through other standards such as WLAN 802.11, *i.e.*, the typical Wi-Fi network. *Id*. ("In this scenario, with WirelessMAN technology bringing the network to a building, users inside the building will connect to it with conventional in-building networks such as, for data, Ethernet (IEEE Standard 802.3) or wireless LANs (IEEE Standard 802.11).").

46. The IEEE 802.16 family of standards (including 802.16ab) did not support mobile users until version 802.16e, approved in 2005. This is confirmed by, for example, another article authored by Roger Marks. Dr. Marks explains that the 802.16 working group "began a new project" to "add support for mobile terminals" in 2002. Ex. 2005 [Marks] 74. While the project "brought in a large number of participants and new technology ideas," it was not until 2005 when the details, including feasibility and desirability, were worked out and support for mobile terminals were supported through the IEEE 802.16e amendment. *Id*.

47. The length of the project was, at least in part, due to the fact that both feasibility and desirability of adding mobility to the IEEE 802.16 standard were uncertain. As the "Call for Contributions" of the project noted, the working group had to "address enhancements to the IEEE 802.16a PHY/MAC to support mobile operation, including cell-to-cell and sector-to-sector handoff capability as well as other protocol and MIB support." Ex. 2004 [Kiernan] 1. The first task of the working group was to determine if adding mobility to IEEE 802.16 was even feasible:

> The initial output of the Study Group is expected to be a series of studies and analyses that would indicate ***whether such a capability can be provided*** within the basic confines of the 802.16a PHY/MAC, what level of mobility (pedestrian, vehicular) could be supported, and the

> extent of the PHY/MAC changes required to support it. It is NOT the current intent of the Study Group to develop a PAR. However, ***if the technical studies indicate that 802.16a enhancement for mobile operation is feasible***, development of a PAR can be expected at some future date.

Ex. 2004 [Kiernan] 1. Note that PAR is Project Authorization Request.

48. The Call for Contributions then lists more than ***a dozen*** bullet points of "technical issues" that needed to be addressed to add mobility to IEEE 802.16. *Id*., 1-2. In fact, even after approving the IEEE 802.16e amendment in 2005, the working group continued its work on other "critical issues" to support mobility, leading to IEEE 802.16f amendment in 2005 and IEEE 802.16g amendment in 2007. Ex. 2005 [Marks] 74. In short, it was not until at least 2005 that the IEEE 802.16 family of standards could support mobile users, with many of the details being worked out even later than 2005.

49. As I explained previously, it was beyond the skills of a POSITA to make fundamental changes to the standards. For example, a POSITA would have had enough knowledge of the technology to understand and deploy equipment adhering to these technical specifications but would have a very limited ability to change the fundamental specifications of the network.

50. Even if mobility could be added to the IEEE 802.16 standard by many experts in the field after years of analysis, it was not at all clear at the outset whether it was desirable to do so to begin with. First, the high frequencies used by the IEEE 802.16 standard that at least initially forced stationary systems were integral to the operation of the standard. As I explained in ¶¶ 43-46 above, IEEE 802.16 was designed as a stationary system that would operate as the last mile connection between a building and the larger metropolitan network, in lieu of using cable networks. This was possible in part because the frequency range of 802.16 was very high frequencies of 10-66 GHz (later expanded to include 2-11 GHz as well). This allowed the system to use unlicensed frequency bands, and also allowed for the very high data rates that were necessary for its intended function of connecting a business or a building to the metropolitan network. However, the high frequencies would also mean that the signal could not tolerate much, if any, non-line-of-sight propagation. In other words, at least initially, there had to be a direct line of sight between the base station and the receiving station. A mobile user that could move anywhere would present a challenge.

51. Additionally, directional receive antennas could be of substantial use in fixed broadband networks that use very high frequencies. While directional antennas could be installed in stationary systems, they were challenging in mobile

stations, especially around the time of the Patent's invention. These reasons are why at least in its early stages, antennas operating based on the IEEE 802.16 standard were stationary and installed on building rooftops in order to receive a direct signal with minimal multipath propagation. Ex. 2003 [Eklund] 98 ("As currently defined through IEEE Standard 802.16, a wireless MAN provides network access to buildings through exterior antennas communicating with central radio base stations (BSs).").

52. The desirability of adding mobility to IEEE 802.16 was not self-evident additionally because of the existence of other standards such as the cellular system (2G, 3G) that already allowed mobile users. As the Call for Contributions by the 802.16 working group explained:

> In addition to the technical issues, there are some other aspects of this effort that we need to keep in mind as we progress towards a possible PAR. ***The one that comes most readily to mind is: What significant advantages or disadvantages does a mobile enhanced 802.16a air interface provide over current or planned 3G mobile networks?*** Related to this is the question of liaison with other Standards Development Organizations such as T1P1, 3GPP and 3GPP2.

Ex. 2004 [Kiernan] 2.

53. Therefore, for the reasons I explained above, it is my opinion that Petitioner has not shown why or how a person of ordinary skill in the art would

have modified the IEEE 802.16ab standard to implement mobile users, or whether that person would have had a reasonable expectation of success in doing so. In fact, I have not seen any analysis from Petitioner on this issue for my analysis and response.

2. Petitioner Has Not Shown A "Ranging Subchannel Compris[ing]" Zero Power Sub-Carriers At Both Ends Of A Block.

54. Claim limitation 1.5 recites that "the ranging subchannel comprises" "one block of subcarriers" and that "power levels of subcarriers at both ends of a block are set to zero." Ex. 1001 ['366 Pat.] 7:23-26. (Independent claims 9, 17 and 22 recite corresponding limitations. *Id*., 8:8-11 (claim 9); 8:56-59 (claim 17); 10:8-11 (claim 22).) Thus, by virtue of reciting that the "ranging subchannel comprises" the zero-power subcarriers at both ends of the block, the claims require that the zero-power subcarriers be a part of the ranging subchannel.

55. The specification discloses this aspect of the claims in substantial detail. For example, Fig. 4, reproduced further below, shows three solid blocks as forming ranging subchannel j, and three hashed blocks as forming subchannel i. Ex. 1001 ['366 Pat.] 3:27-29; Fig. 4. The Patent then explains that "the power of the subcarriers towards the boundary … of a block," *i.e*., within the block, is lower, and set to zero in a special case:

FIG. 4 illustrates two ranging subchannels, each of which is composed of multiple blocks of subcarriers. FIG. 4 schematically shows that the signal power of the subcarriers towards the boundary (the lower ends and the higher ends in frequency) of a block is lower than that of the subcarriers towards the center of the block. (In a special case, the power levels of the two subcarriers at both ends of a block are set to zero.).

Ex. 1001 ['366 Pat.] 3:27-35; *see also id.*, 4:6-13.

56. The Patent's Fig. 4, reproduced below with annotations in red, also shows that the zero-power (or lower power) subcarriers "towards the boundary … of a block" are within the block, and within the subchannel that comprises the block:

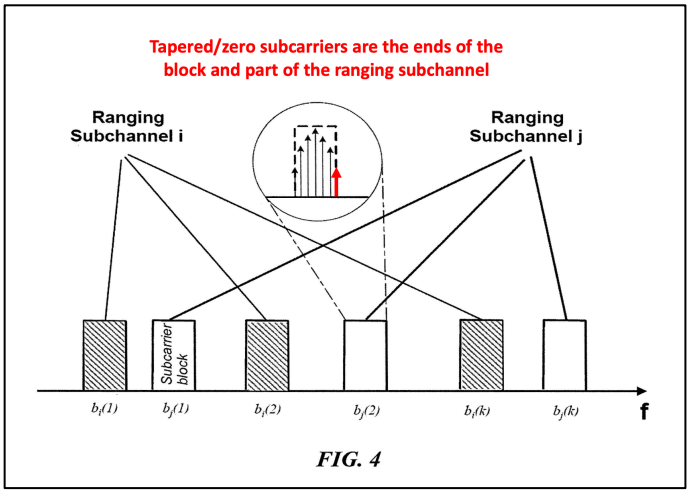


FIG. 4

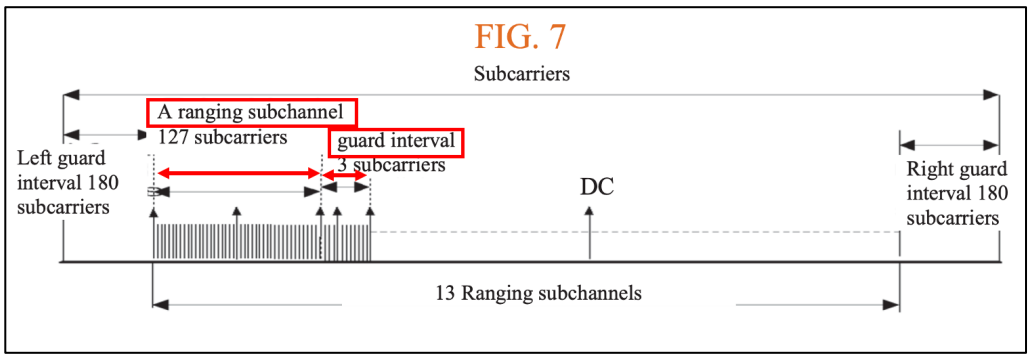
57. Petitioner relies on the combination of Jeong and Suzuki for this limitation. Pet., 30-33. However, Jeong clearly states that its guard intervals are

provided ***between*** subchannels, and are not taught to be a part of the subchannel itself:

> Another embodiment of the present invention will be described with reference to FIG. 7. When in 2K mode with 180 guard intervals on the left and right side of the ranging sub-channel structure, a ranging sub-channel consisting of 128 or 127 carriers R_ch$_m$ (m-1, …, 13) is configured, and a ranging sub-channel allocation in which ***a guard interval is provided between adjacent ranging sub-channels*** is presented. At this time, ***the guard interval between ranging sub-channels*** provide 2 subcarriers for a length of 128 ranging sub-channel and 3 sub-carriers for a length of 127.

Ex. 1008 [Jeong] 0008.

58. Jeong's Fig. 7 also shows that Jeong's guard intervals are provided between adjacent sub-channels, and are not defined as a part of the sub-channels. I have reproduced Jeong's Fig. 7 below with some annotations to highlight this point:



59. Jeong further explains that the sizes of both its subchannel and the ranging code are 127 subcarriers:

> The ranging code used here is a gold code, and the length of the ranging code is 127, which is the length of one ranging subchannel.

Ex. 1008 [Jeong] 0009. Because the ranging code spans the entire size of the ranging subchannel, the subchannel does not and cannot include the zero-power guard subcarriers.

60. In an apparent recognition of Jeong's difference from the claims, Petitioner states that:

> [T]o the extent "block of subcarriers" is interpreted to include the guard subcarriers at both ends, Jeong's 127 subcarrier ranging sub-channel plus one or more guard subcarriers on each end is a "block of subcarriers."

Pet., 31.

61. The distinction between Jeong and claim, however, is not whether one chooses to consider the block of subcarriers as including or excluding the guard subcarriers; rather, it is whether the ranging subchannel definition includes the guard subcarriers. Even if one were to consider "Jeong's 127 subcarrier ranging sub-channel plus one or more guard subcarriers on each end" as a "block of subcarriers" (Pet., 31), it does not change the fact that Jeong's definition of its sub-

channels excludes the guard sub-carriers and, therefore, the guard subcarrier portion of this newly defined "block" would fall ***outside of*** Jeong's ranging subchannel.

62. The distinction between Jeong and the claims is not inconsequential. As I explained above, Jeong carefully defines its subchannels, and that definition excludes the guard subcarriers between the subchannels. *Id*., 0008-0009; Fig. 7. In contrast, as I also explained above, the '366 Patent defines potential zero-subchannels to be a part of the ranging subchannel. Ex. 1001 ['366 Pat.] 3:27-39, 4:6-13, Fig. 4. This distinction is material, and the Patent's approach has recognized benefits.

63. One example of the benefits of the disclosed and claimed requirement that the guard bands be part of the defined ranging subchannel is that the ranging subchannel can be dynamically moved around the frequency band without requiring the other subcarriers outside of the subchannel be re-configured to include guard bands. This is because the ranging subchannel already includes its guard bands within it to limit interference vis-à-vis its surroundings, and thus can be moved around dynamically without interreference with its surrounding frequencies, and therefore without any need to modify the surrounding subcarriers. To the contrary, in Jeong, any alteration of the ranging subchannel location would

also require altering the types of subcarriers that would fall outside of the ranging subchannel both at the ranging subchannels original and new locations. The former guard subcarriers would need to be converted to some other use or left unused as a wasted resource, and subcarriers surrounding the new location of the ranging subchannel would need to be converted from other use to guard bands. Converting the surrounding subcarriers to guard bands can precipitate a further reconfiguration of even more subcarriers that were previously grouped for use with the surrounding subcarriers that are now used as guard bands. For example, the surrounding subcarriers now converted into a guard band may have been previously used as data subcarriers that were allocated as part of a data subchannel with other data subcarriers. By reassigning the surrounding data subcarriers as guard subcarriers, the data subchannel with fewer remaining data subcarriers may not be able to sustain the same throughput as originally configured. As such, additional subcarriers may need to be reallocated to said data subchannel to maintain its intended operation. However, when working with limited subcarriers as in any practical system, these additional subcarriers may need to be taken from yet another subchannel. Thus, a cascade effect may be experienced wherein the entire channel comprising the full ensemble of subcarriers may need to be overhauled to support a ranging subchannel as so designed by Jeong. On the other

hand, such an overhaul of the channel is avoided when the zero-power subcarriers at both ends of the block are a part of the ranging subchannel itself, as claimed in the '366 patent. In short, substantial channel reconfiguration is necessary for dynamically reconfiguring Jeong's ranging subchannels.

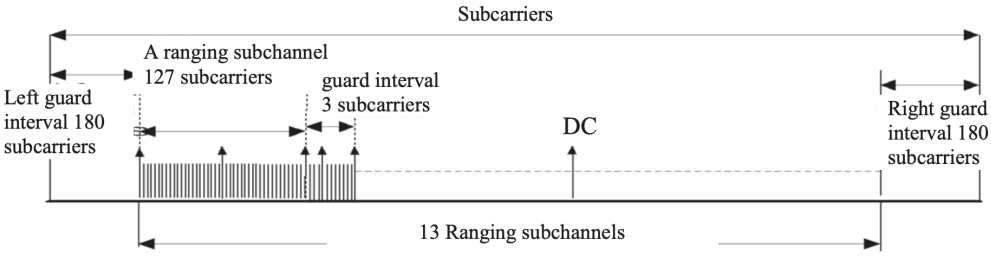
64. The '366 patent describes the importance of being able to dynamically shape the ranging signal through its location within the frequency band. In one exemplary embodiment, the specification describes moving the ranging subchannel around the frequency band to minimize redundancy in the co-sampling function, resulting in a ranging signal with a narrow main peak and low sidelobes. Ex. 1001 ['366 Pat.] 4:49-5:9; Fig. 8. Without the guard bands defined as part of the subchannel itself, when a block within the subchannel is moved, the subcarriers adjoining the block at its new location would need to be altered to become guard bands, and shaping the ranging signal in the manner described in this embodiment would require several iterations of manually changing the subcarrier functions in and around each ranging block.

65. As another example, the Patent explains that the zero-power subcarriers being defined as a part of the subchannels allows the zero-power subcarriers to be zero only in "a special case," and otherwise be simply tapered to a value above zero or not tapered at all. *Id*., 3:29-34, 4:8-11. This is not possible in

Jeong, where the guard bands are not part of the ranging subchannel and would need to have a fixed value (likely zero).

66. Petitioner also argues that Jeong "does not describe the details of the guard subcarriers, which would have led a POSA to Suzuki's zero-power subcarriers." Pet., 23; *see also id*., 32-33 (similar). But this premise is incorrect. Jeong clearly discloses the locations of its guard subcarriers where it believes they are desired. For example, in the context of Jeong's Fig. 7, relied upon by Petitioner (Pet., 31), Jeong explains that "[w]hen in 2k mode with ***180 guard intervals on the left and right side of the ranging sub-channel structure***," each "ranging sub-channel has a length of 127," and "***a guard interval with a length 3 [exists] between the ranging sub-channels***" is provided. Ex. 1008 [Jeong] 0008. As also demonstrated in Jeong's Fig. 7 reproduced below, Jeong clearly shows that guard intervals of length 180 sub-carriers exist at the two ends of the entire sub-channel structure, and guard intervals of length 3 sub-carriers exist between each sub-channel of length 127:

FIG. 7



67. Thus, there is no lack of "details of the guard subcarriers" in Jeong to have "led" the POSITA to Suzuki. Jeong does provide complete details, and it simply does not structure its system similar to the claims.

68. Finally, Petitioner's proffered motivation for modifying Jeong in view of Suzuki is to "prevent interference." Pet., 23, 33. However, Petitioner does not provide any analysis or evidence that the guard intervals would have provided better interference protection if they were a part of the subchannel as opposed to between the subchannels. Petitioner does not identify any shortcoming in Jeong, or any benefit from modifying Jeong, or any other reason why a POSITA would modify Jeong in view of Suzuki.

69. For the additional reasons above, it is my opinion that Petitioner has not shown that its ground 1 render the claims obvious.

B. Petitioner's Ground 3.

70. Limitation 1.5 requires that "the ranging subchannel comprises at least one block of subcarriers within the communication channel and power levels of subcarriers at both ends of a block are set to zero." Ex. 1001 ['366 Pat.] 7:23-26. Independent claims 9, 17 and 22 recite similar limitations. *Id*., 8:8-11 (claim 9); 8:56-59 (claim 17); 10:8-11 (claim 22). Petitioner relies on its discussion of limitation 1.5 in connection with the corresponding limitation in all independent

claims. Pet., 70-71. As I will explain below, Petitioner does not show either a motivation or a reasonable expectation of success for using zero-power subcarriers in ranging subchannels of its second ground references.

71. Petitioner maps the subcarriers of a ranging subchannel in the IEEE 802.16ab standard to the claimed ranging subchannel that "comprises" "at least one block of subcarriers." Specifically, Petitioner argues that 802.16ab "discloses that 'subcarriers' are 'grouped into sub-channels,'" and therefore, "the ranging subchannel(s) disclosed by 802.16ab … include 'at least one block of subcarriers within the communication channel.'" Pet., 69 (internal citations and emphasis omitted). For example, Petitioner's expert cites 802.16ab Fig. 158, reproduced below, which shows the top two subchannels highlighted in grey assigned for ranging:

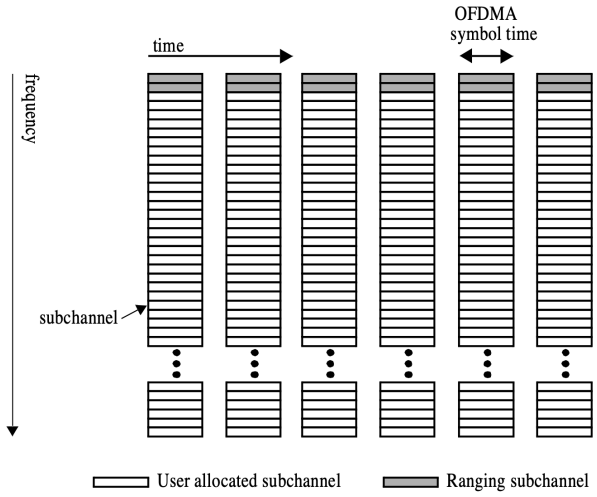


Figure 158—Ranging subchannel allocation, method #2

Ex. 1012 [802.16ab] 0087 (cited by Ex. 1003 [Cimini-Decl.] ¶ 173).

72. Petitioner recognizes that IEEE 802.16ab does not disclose "the power levels of subcarriers at both ends of a block are set to zero" in connection with ranging subchannels. Pet., 69-70. But Petitioner argues that because IEEE 802.16ab discloses guard subcarriers elsewhere, it would have been obvious for the POSITA to look into Suzuki for more details and to apply those guard subcarriers also to the ranging sub-channels "to reduce interference." Pet., 59. Specifically, Petitioner argues that IEEE 802.16ab's disclosure of guard subcarriers elsewhere

> would have motivated a POSA to look to Suzuki, who discloses additional details of guard bands, such as where to place guard bands (e.g., both ends of one band slot) and their power level (e.g., zero).

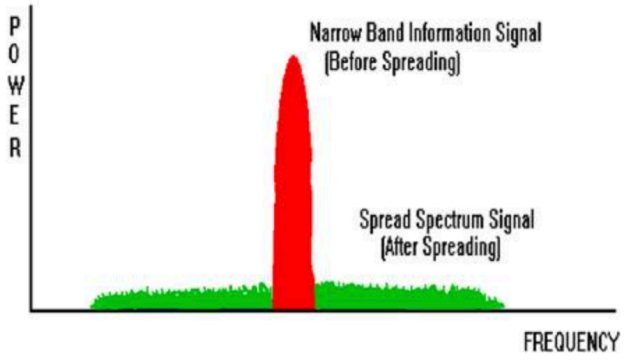
Pet., 59.

73. However, as I will explain below, Petitioner's unstated premise, that the IEEE 802.16ab's lack of disclosure of guard subcarriers in connection with its ranging subchannels, was a teaching that this was an option left to the discretion of the POSITA to modify as necessary "to reduce interference" is incorrect. Instead, the IEEE 802.16ab standard deliberately did not utilize guard bands in connection with ranging subchannels, because those subchannels utilize the CDMA spreading technology that has a high resistance to interference.

74. CDMA (Code Division Multiple Access) is a method of allowing multiple users to access the bandwidth, and is based on spreading technology. In

this method, instead of each user only utilizing an assigned portion of the frequency band, all users utilize the entire available frequency band. For example, if four subchannels are assigned for ranging, all users would use all four subchannels simultaneously.

75. Each user is assigned a code (sometimes generated based on a pseudo-random number). The user "spreads" the information signal based on its assigned code to cover the entire available frequency bandwidth but with a lower power density. This is shown schematically below, where the red signal is the information signal before spreading, and the green signal is the information signal after spreading:



76. The receiver of the spread signal is also in possession of the CDMA code that was assigned to the user, and can extract the intended data by applying the reverse of the spreading process. Because each user's spreading code is unique

(a part of a pseudo-random generated signal), all users can send their spread signals in the same channel.

77. By analogy, consider a room where multiple people simultaneously speak in different languages. A listener fluent in a specific language can detect the words of the person speaking in that language, while disregarding the other persons speaking in other languages.

78. This basic aspect of CDMA operation is similarly explained in a Mobile Communication Handbook submitted by Petitioner as an exhibit:

> When using CDMA, each signal in the set is given its own spreading sequence. As opposed to either FDMA, wherein all users occupy disjoint frequency bands but are transmitted simultaneously in time, or TDMA, whereby all users occupy the same bandwidth but transmit in disjoint intervals of time, ***in CDMA, all signals occupy the same bandwidth and are transmitted simultaneously in time; the different waveforms in CDMA are distinguished from one another at the receiver by the specific spreading codes they employ***.

Ex. 1010 [Gibson] 0193.

79. Additionally, the IEEE 802.16ab standard utilizes the CDMA spreading process in connection with its ranging operation. For example, 802.16ab expressly states that the Ranging Code assigned to each user is "a CDMA code":

> The SS [subscriber station], after acquiring downstream synchronization and upstream transmission parameters, shall choose randomly a Ranging Slot (with the user of a binary truncated exponent algorithm to avoid of possible re-collisions) as the time to perform the ranging, then ***it chooses randomly a Ranging Code (from the Initial Ranging domain) and sends it to the BS (as a CDMA code)***.

Ex. 1012 [802.16ab] 0088.

80. The standard further confirms its CDMA ranging operation by explaining that the usage of the ranging subchannels are based on the PN code (pseudo-noise code) randomly selected by each user. Ex. 1012 [802.16ab] 0204 ("[t]he usage of the Sub-Channel for ranging is done by the transmission of a Pseudo Noise (PN) code on Sub-Channel allocated for ranging transmission."); ("Each user randomly chooses one code …."). These are the codes used for spreading the user's signal.

81. Furthermore, in the IEEE 802.16ab standard, the size of the ranging CDMA code assigned to each user is equal to the combined size of all subchannels assigned for ranging, resulting in ***each user's signal being spread across all the subchannels forming the entire ranging frequency spectrum***. The standard explains that the length of the Ranging Code is in multiples of 53 bits, and it depends on how many sub-channels are allocated for ranging. Ex. 2012

[802.16ab] 0204. For example, "the default for the 2k mode is 2 sub-channels" allocated for ranging, and, "therefore the ranging code length is 106." *Id*. Thus, the length of the ranging code would equal ***the combined length of all subchannels allocated for ranging*** because the user would spread its ranging signal across the entire available bandwidth.

82. The combination of Koo and 802.16ab would similarly operate. Notably, Petitioner does not rely on Koo for limitation 1.5. Pet., 69-70. But in any event, Koo utilizes a spreading operation similar to IEEE 802.16ab. Koo explains that a Pseudorandom Noise is used to assign codes to specific users, and because "[t]ypically, one ranging channel is composed of two ranging sub-channels, each having the length of 53 bits, the ranging code is 106 bits long." Ex. 1011 [Koo] [0032]. It then states that "[t]hese ranging processes and their function are the same as those in the aforementioned prior art." *Id*. Thus, similar to the typical CDMA operation also utilized by IEEE 802.16ab for ranging, each user is assigned a code, which is the size of the entire frequency spectrum assigned for sub-ranging, and which the user then utilizes to spread its information signal across the entire ranging spectrum.

83. The IEEE 802.16ab's decision not to utilize guard subcarriers for ranging subchannels was a deliberate choice. The IEEE 802.16ab standard was the

result of years of analysis and deliberations by the experts in the field. They were obviously aware of guard bands, and, as I will explain below, the standard discloses them where necessary. However, the standard deliberately defines its ranging code to expand the entirety of the bandwidth of all ranging subchannels without any guard subcarriers in connection with the ranging subchannels. Ex. 1012 [802.16ab] 0204 (explaining that each subchannel is 53 bits, and the ranging code size is a multiple of 53 depending on how many subchannels are allocated for ranging). This is not an oversight or an omission. Rather, it is because the standard uses CDMA for ranging, which was well known to be resistant to interference, and thus, not requiring guard bands.

84. For example, the IEEE 802.16ab standard explains that users "are allowed to collide" on the ranging subchannels because the "colliding codes" can be separated through the user's randomly selected ranging code:

> Measurements of Time (ranging) and Power are performed by allocating several Sub-Channels to one Ranging Sub-Channel. ***Users are allowed to collide on this Sub-Channel.*** Each user randomly chooses one code from a bank of specified binary codes. … The Base Station can then separate colliding codes and extract timing (ranging) information and power.

Ex. 1012 [802.16ab] 0204.

85. Further evidence that the standard's omission of guard bands from the ranging subchannels was a deliberate design choice, the standard does disclose guard bands in other situations where it deems them desirable. For example, Petitioner relies on the standard's discussion of guard bands, and argues that "these teachings would have motivated a POSA to look to Suzuki, who discloses additional details of guard bands, such as where to place guard bands (e.g., both ends of one band slot) and their power level (e.g., zero)." Pet., 59 (citing Ex. 1012 [802.15ab] 0175). But, contrary to Petitioner's assertion, even the very page of the IEEE 802.16ab standard cited by Petitioner does specify both the power level of the guard bands, and their location—it simply elects not to structure them at the location required by the claims. Specifically, as the annotated versions of the standard's Figs. 214 and 215, reproduced below, show, the standard discloses "guard bands," but does not place them within or in connection with any ranging subchannels. Rather, it places them at the very end of the entire communication channel, *i.e.*, at both ends of the entire bandwidth assigned to the system:

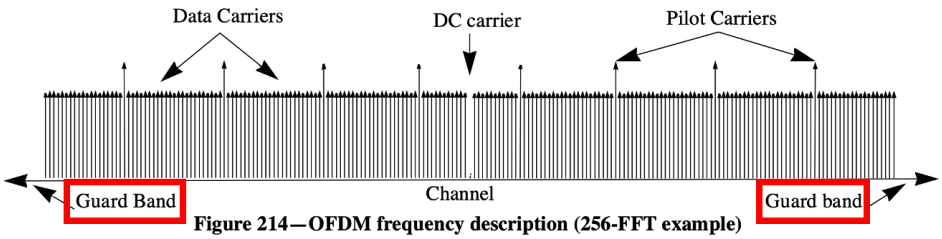


Figure 214—OFDM frequency description (256-FFT example)

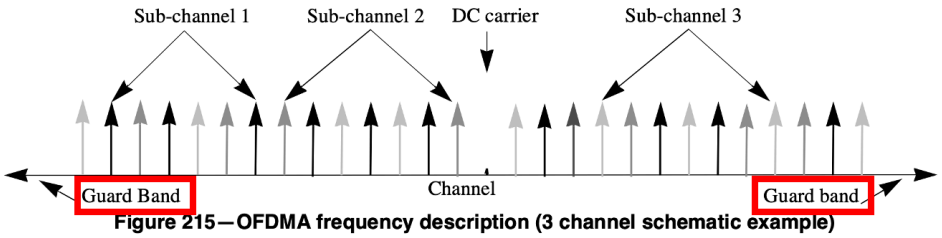


Figure 215—OFDMA frequency description (3 channel schematic example)

Guard Bands are only placed at the end of the entire communication channel.

86. As another example, even in the context of the ranging operation, the standard discloses a quiet interference monitoring time, but still elects not to include any guard frequency bands in connection with ranging. Specifically, the standard explains that TDD (Time Division Duplexing) can be used as an alternative scheme of allocating ranging subchannels. Ex. 1012 [802.16ab] 0086. In TDD, ranging is temporally separated from all other operations by allocating all available subchannels to ranging during a first time interval, and allocating all available subchannels to other operations during a second time interval. *Id.*, 0086-0087; Fig. 157. In that context, the standard determined that a quiet interference monitoring period is beneficial that temporally separates the ranging operation

from the other operations, as shown in the annotated version of the standard's Fig. 157, reproduced below:

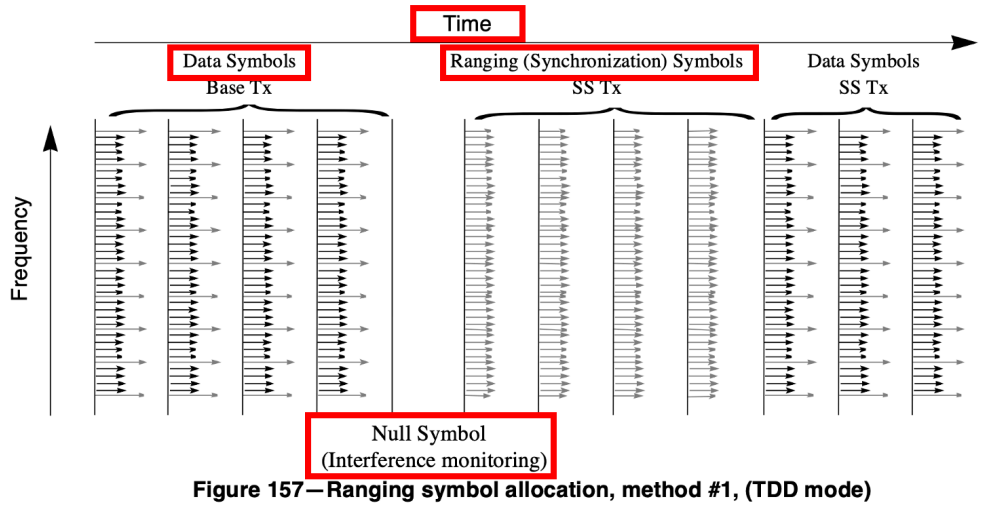


Figure 157—Ranging symbol allocation, method #1, (TDD mode)

87. This further confirms that the standard not allocating frequency guard subcarriers to or in connection with ranging subchannels was a deliberate design choice.

88. The IEEE 802.16ab standard's teaching not to include guard frequency subcarriers in connection with ranging signals is due to the well-known fact that CDMA signals have a high tolerance to interference, as documented in various literature. For example, Mobile Communication Handbook, submitted by Petitioner as an exhibit, explains that resistance to interference is an inherent property of spreading methods because the interference occurs after the signal is

already spread, and its effect is greatly diminished after the original signal is despread:

> In the presence of narrowband interference, however, there is a significant advantage to employing the spreading/despreading procedure described. The reason for this is as follows. Since the interference is introduced after the transmitted signal is spread, then, whereas the despreading operation at the receiver shrinks the desired signal back to its original bandwidth, at the same time it spreads the undesired signal (interference) in bandwidth by the same amount, thus reducing its power spectral density. ***This, in turn, serves to diminish the effect of the interference on the receiver performance***, which depends on the amount of interference power in the despread bandwidth. ***It is indeed this very simple explanation, which is at the heart of all spread spectrum techniques.***

Ex. 1010 [Gibson] 0184.

89. As a result, Gibson explains, spreading techniques are used in the military because they "are ***robust to interference generated by an intelligent adversary***," and are used in the commercial settings due to their resistance to interference. *Id*., 0195. Gibson then explains that ***even if spreading signals are overlaid directly on top of narrowband frequency signals such that they occupy the same time and frequency***, their resistance to interference would allow the

system to properly operate in connection with potential interference ***both for the spread signal and for the narrowband frequency signals***:

> To illustrate these two ideas, consider a scenario whereby a given band of frequencies is somewhat sparsely occupied by a set of conventional (i.e., nonspread) signals. To increase the overall spectral efficiency of the band, a set of spread spectrum waveforms can be overlaid on the same frequency band, thus forcing the two sets of users to share common spectrum. … ***Because of the interference suppression properties of spread spectrum waveforms, the despreading process at each spread spectrum receiver will attenuate the components of the final test statistic due to the overlaid narrowband signals. Similarly, because of the LPI [Low Probability of Intercept] characteristics of spread spectrum waveforms, the increase in the overall noise level as seen by any of the conventional signals, due to the overlay, can be kept relatively small.***

Ex. 1010 [Gibson] 0195.

90. In my opinion, Petitioner has not shown why a POSITA would have modified the IEEE 802.16ab standard in view of Suzuki to add guard subcarriers in connection with its ranging subchannels. Suzuki discloses a system where each set of consecutive 24 subcarriers are grouped together, similar to a subchannel, with the first and last subcarriers within the set having zero-power. Ex. 1009 [Suzuki] 3:5-20. For its combination, Petitioner argues that a POSITA would look into

Suzuki to add guard bands between IEEE 802.16ab's ranging subchannels, and its proffered motivation is "to reduce interference." Pet., 59; *see also id*. ("inserting guard bands between frequency bands was a well-known technique …").

91. However, as I explained above, there is no evidence that a POSITA would believe interference in connection with IEEE 802.16ab's ranging subchannels is a problem that needs improvement. Specifically, the standard deliberately uses CDMA spreading techniques for ranging, which was well known for its high resistance to interference, and states that "users can collide" on the ranging subchannels. Ex 1012 [802.16ab] 0204. As explained in Ex. 1010 [Gibson] 0184, 0195, this is an inherent property of the spreading process, which also resulted in spreading process to be used for military purposes. As Gibson explained, even if the spread signals were laid directly on top of other narrow frequency band data, there would not necessarily be interference problems either for the spread signals or for the narrow band frequency data. *Id*., 0195.

92. Therefore, Petitioner does not show why a POSITA would have understood there to be undesired interference to be reduced, or even what the source of this interference is—or, even if there was any minimal interference, why the POSITA would have understood the detrimental effects of guard bands to have been outweighed by this justification.

93. A POSITA would understand that adding guard bands would carry a substantial cost, and would not be motivated to add them without a compelling and real interference problem that could be solved with guard bands. Specifically, if subcarriers are converted to guard subcarriers instead of being used in the spreading process carrying data, that has adverse impacts for the CDMA process. For example, the power in the remaining subcarriers that are used for spreading would have to be increased, which would reduce the interference resistance properties of the process. As another example, the spreading code would become smaller, which would reduce the separation of various spread signals submitted by different users. A smaller bandwidth available for the spreading process would also reduce the number of users that could reliably utilize the bandwidth. In short, adding guard bands could have detrimental consequences for the system and a POSITA would not add them unless there was a real problem with interference, which is not shown to exist here for IEEE 802.16ab's ranging process.

94. Petitioner has also not shown that the POSITA would have had a reasonable expectation of success in adding guard subcarriers to the IEEE 802.16ab standard's ranging subchannels. As I previously explained, a POSITA would not have been required to design a wireless system from the ground up. This is because many important parameters and design choices had already been

made by standard setting committees. Thus, a POSITA would have had enough knowledge of the technology to understand and deploy equipment adhering to these technical specifications but would have a very limited ability to change the fundamental specifications of the network. This is further confirmed by the fact that Carl Eklund, Roger Marks, Kenneth Stanwood, and Stanley Wang, who all had heavy involvement in the development of the IEEE 802.16 standard, were all of extraordinary skill in the field. Ex. 2003 [Eklund] 107 (biographies).

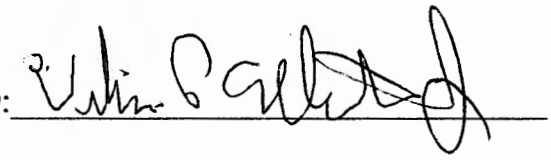
95. For all of the foregoing reasons, it is my opinion that Petitioner has not shown that its ground 3 renders the claims obvious.

VI. CONCLUSION

96. For the foregoing reasons, based on my expertise and experience and the record of this case that I have reviewed, it is my opinion that the Challenged Claims are not shown to be disclosed or obvious.

97. I understand that my opinions discussed above support a legal conclusion that the challenged claims are nonobvious.

I hereby declare that all statements made herein of my own knowledge are true and all statements made herein on information and belief were and are believed by me to be true, and that all statements herein were and are 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 and that any such willful false statements may jeopardize the validity of the application or any patents issued thereon.

June 29, 2023 SIGNED: 

William P. Alberth, Jr.