IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Xiaodong Li, et al.	
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Appl. Serial No.:	13/205,579	
Filing Date:	August 8, 2011	
Title:	METHODS AND APPARATUS FOR RANDOM ACCESS IN MULTI-CARRIER COMMUNICATION SYSTEMS	

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PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT NO. 8,467,366 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42

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EXHIBITS

HONDA-1001	U.S. Patent No. 8,467,366 to Li, et al. ("the '366 Patent")
HONDA-1002	Excerpts from the Prosecution History of the '366 Patent ("the Prosecution History")
HONDA-1003	Declaration of Leonard J. Cimini, Jr., Ph.D.
HONDA-1004	Curriculum Vitae of Leonard J. Cimini, Jr., Ph.D.
HONDA-1005	Declaration of Sylvia Hall-Ellis, Ph.D.
HONDA-1006	Declaration of Richard M. Bemben
HONDA-1007	KR 2003-0058589 A to Jeong et al.
HONDA-1008	Certified translation of KR 2003-0058589 A to Jeong et al. ("Jeong")
HONDA-1009	U.S. Patent No. 5,903,614 to Suzuki et al. ("Suzuki")
HONDA-1010	Jerry D. Gibson, "The Mobile Communications Handbook," 2nd Edition, CRC Press LLC, 1999 ("Gibson")
HONDA-1011	U.S. Pub. No. 2003/0198179 A1 to Koo et al. ("Koo")
HONDA-1012	Air Interface for Fixed Broadband Wireless Access Systems, Part A: Systems between 2 and 11 GHz, IEEE 802.16ab-01/01r2, July 2001 ("802.16ab")
HONDA-1013	WO 03/075500 A2 to Chayat et al. ("Chayat")
HONDA-1014	RESERVED
HONDA-1015	U.S. Copyright Office record: The mobile communications handbook / editor-in-chief, Jerry D. Gibson.
HONDA-1016	October 26, 2001 Letter from Chairman of ETSI Project Broadband Radio Access Networks, Jamshid Khun-Hush, Dr.-Ing., to Dr.

	Roger B. Marks, Chair IEEE 802.16 Working Group on Broadband Wireless Access
HONDA-1017	Krinock et al., "Fast and Efficient BW Request Mechanism for IEEE 802.16a OFDM PHY," November 8, 2001
HONDA-1018	Cimini, "Analysis and Simulation of a Digital Mobile Channel Using Orthogonal Frequency Division Multiplexing," IEEE Trans. Comm., Vol. 33, No. 7, July 1985.
HONDA-1019	U.S. Patent No. 3,488,445 to Chang
HONDA-1020	Dell Inc. v. Neo Wireless LLC, IPR2021-01480, Paper 11 (P.T.A.B. March 16, 2022).
HONDA-1021	Defendant's Proposed Interpretations, In Re Neo Wireless, LLC Patent Litigation, 2:22-MD-03034 (E.D. Mich.), Dec. 30, 2022.
HONDA-1022	U.S. Patent No. 6,556,557 to Cimini, Jr. et al.
HONDA-1023	U.S. Patent No. 6,928,084 to Cimini, Jr. et al.
HONDA-1024	Transfer Order, Docket No. 18, Neo Wireless, LLC v. Volkswagen Group of America, Inc., Case No. 1:22-cv-00076 (E.D. Tenn.) (June 14, 2022).
HONDA-1025	Docket Sheet, Neo Wireless, LLC v. Volkswagen Group of America, Inc. et al., Case No. 2:22-cv-11404 (E.D. Mich.)
HONDA-1026	United States District Courts – National Judicial Caseload Profile, June 2022
HONDA-1027	June 21, 2022 Memorandum: Interim Procedure for Discretionary Denials in AIA Post Grant Proceedings with Parallel District Court Litigation ("June 2022 Memo")
HONDA-1028	Plaintiff Neo Wireless LLC's Disclosure Of Proposed Interpretations And Evidence Of Disputed Claim Terms, In Re Neo Wireless, LLC Patent Litigation, 2:22-MD-03034-TGB, December 30, 2022.

HONDA-1029	Carl Eklund, et al., "IEEE Standard 802.16: A Technical Overview of the WirelessMAN™ Air Interface for Broadband Wireless Access," IEEE Communications Magazine, June 2002.
HONDA-1030	Working Group Review Document 802.16ab-01/01r2 (IEEE Projects P802.16a/P802.16b), September 26, 2001.
HONDA-1031	Minutes of IEEE 802.16 Session #15, Denver, CO, USA, October 3, 2001.
HONDA-1032	Minutes of IEEE 802.16 Plenary Session #16, November 19, 2001.
HONDA-1033	Docket Navigator, Ohio Southern District Time to Milestones, accessed March 29, 2023
HONDA-1034	United States District Courts – National Judicial Caseload Profile
HONDA-1035	Declaration of Dr. R. Michael Buehrer

I. INTRODUCTION

American Honda Motor Co., Inc. ("Petitioner" or "Honda") petitions for *Inter Partes* Review ("IPR") of claims 1-24 ("the Challenged Claims") of U.S. Patent No. 8,467,366 ("the '366 Patent"). The '366 patent should never have issued. It simply summarizes a wireless communications "problem" and includes cursory descriptions of a handful of embodiments addressing that "problem"—all of which were well-known long before the patent's earliest possible priority date, March 9, 2004.

Specifically, the '366 patent purports to solve the "problem" of signals from multiple mobile stations interfering with one another when mobile stations are attempting to establish connections with a base station. But the specification's description of the purportedly inventive solution—which spans a mere four columns—reads more like a literature summary than a patent. The first two columns provide a general description of OFDMA wireless communications that closely mirrors disclosures made in an existing wireless standard document, IEEE 802.16ab-01/01r2 ("802.16ab"). *Compare* EX1012, 0175-76, FIG. 215, *with*, EX1001, 2:57-3:16, FIG. 1. For example, 802.16ab's disclosure that an "OFDM symbol is made up from carriers" and of the three carrier types: "Data carriers - for data transmission"; "Pilot carriers - for different estimation purposes"; and "Null

carriers - no transmission at all, for guard bands and DC carrier," EX1012, 0175, is mirrored in the '366 patent's detailed description, *see* EX1001, 2:64-3:4.

The next two columns of the detailed description provide a listing of several different embodiments for how signals can be transmitted to reduce interference. EX1001, 4:8-5:18. No more than a handful of high-level sentences is used to describe each of these embodiments, and all of the embodiments—particularly at this level of detail—were well-known and obvious by March 2004. The scant descriptions of the alleged inventive concepts that served as the basis for allowance—OFDM signals exhibiting low PAPR and using zero-power guard bands—further illustrate their obviousness. Indeed, the specification's descriptions of these concepts is even less detailed than the descriptions of those concepts in the prior art. *Cf. In re Epstein*, 32 F.3d 1559, 1568 (Fed. Cir. 1994) ("that [an] appellant did not provide the type of detail in his specification that he now argues is necessary in prior art references supports" a finding that "one skilled in the art would have known how to implement the features").

Not surprisingly in view of the specification's lack of substance, the '366 patent claims are rendered obvious several times over: first in the Jeong-based Grounds (1 & 2), and again in the Koo-based Grounds (3 & 4). The obviousness of these claims is further demonstrated by the testimony of Dr. Leonard Cimini, which is corroborated by numerous additional references.

Dr. Cimini has over 40 years of experience in wireless technologies and standards, various communications technologies, networking, OFDM, and physical and media access control (MAC) layer technology. While working at Bell Laboratories from 1982-1985, he proposed and analyzed the use of OFDM in mobile radio systems. His proposal was the first application of OFDM to wireless systems, which has become the basis for much of the current, widespread use of OFDM today. Dr. Cimini is recognized as one of the pre-eminent wireless communications experts, having authored or co-authored more than 190 industry publications, being listed as an inventor on twenty patents—several of which are cited to corroborate his testimony—and having received some of the industry's most prestigious honors and awards.

In sum, the prior art's teachings, supported by Dr. Cimini's testimony, "fit … together like pieces of a puzzle," *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 402 (2007), and render all of the challenged claims obvious. The Board should institute review and cancel claims 1-24.

II. MANDATORY NOTICES

REAL PARTY IN INTEREST: American Honda Motor Co., Inc. and Honda Development & Manufacturing of America, LLC (collectively, "Honda") are the real parties-in-interest.

RELATED MATTERS: The '366 patent is the subject of the following civil actions: *Neo Wireless LLC v. Dell Technologies Inc.*, 6-21-cv-00024 (W.D. Tex.),

filed January 12, 2021; *Neo Wireless LLC v. Dell Technologies Inc.*, 1-22-cv-00060 (W.D. Tex.), filed January 12, 2021; *Neo Wireless LLC v. LG Electronics Inc.*, 6-21-cv-00025 (W.D. Tex.), filed January 13, 2021; *Neo Wireless LLC v. Apple Inc.*, 6-21-cv-00026 (W.D. Tex.), filed January 13, 2021; *Neo Wireless, LLC v. Ford Motor Company*, 4-22-cv-00210 (W.D. Mo.), filed March, 29, 2022; *Neo Wireless, LLC v. American Honda Motor Co., Inc.*, 2-22-cv-01824 (S.D. Ohio), filed March 29, 2022; *NEO Wireless, LLC v. Nissan North America Inc.*, 3-22-cv-00220 (M.D. Tenn.), filed March 29, 2022; *Neo Wireless LLC v. Toyota Motor North America, Inc.*, 2-22-cv-00093 (E.D. Tex.), filed March 29, 2022; *Neo Wireless LLC v. General Motors Company*, 2-22-cv-00094 (E.D. Tex.), filed March 29, 2022; *Neo Wireless LLC v. Tesla, Inc.*, 2-22-cv-00095 (E.D. Tex.), filed March 29, 2022; *Neo Wireless, LLC v. Volkswagen Group of America, Inc.*, 1-22-cv-00076 (E.D. Tenn.), filed March 29, 2022; *In re: Neo Wireless, LLC Patent Litigation*, 2-22-MD-03034 (E.D. Mich.), filed June 23, 2022; *Neo Wireless, LLC v. Ford Motor Company*, 2-22-cv-11402 (E.D. Mich.), filed June 27, 2022; *Neo Wireless, LLC v. American Honda Motor Co., Inc.*, 2-22-cv-11403 (E.D. Mich.), filed June 27, 2022; *Neo Wireless, LLC v. Volkswagen Group of America, Inc.*, 2-22-cv-11404 (E.D. Mich), filed June 28, 2022; *Neo Wireless, LLC v. Nissan North America Inc.*, 2-22-cv-11405 (E.D. Mich), filed June 29, 2022; *Neo Wireless LLC v. Toyota Motor North America, Inc.*, 2-22-cv-11406 (E.D. Mich), filed June 28,

2022; *Neo Wireless LLC v. General Motors Company*, 2-22-cv-11407 (E.D. Mich.), filed June 28, 2022; *Neo Wireless LLC v. Tesla Inc.*, 2-22-cv-11408 (E.D. Mich), filed June 28, 2022; *Neo Wireless, LLC v. FCA US LLC*, 2-22-cv-011770 (E.D. Mich.), filed Aug. 2, 2022; and *Neo Wireless, LLC v. Mercedes-Benz USA, LLC*, 2-22-cv-11769 (E.D. Mich.), filed Aug. 2, 2022.

The '366 patent was also the subject of *Dell Inc. v. Neo Wireless LLC*, IPR2021-01480. The petition was filed on September 16, 2021, and denied institution on March 16, 2022.

Petitioner has previously filed petitions for *inter partes* review of commonly-assigned U.S. Patent Nos. 10,075,941 (IPR2022-01537); 10,771,302 (IPR2022-01538); 10,965,512 (IPR2022-01539); 10,447,450 (IPR2022-01567); and 10,833,908 (IPR2023-00086), which have also been asserted in the above litigations.

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III. GROUNDS FOR STANDING

The undersigned and Petitioner certify that the '366 patent is available for IPR and Petitioner is not barred or estopped with Honda having been served on March 30, 2022.

IV. IDENTIFICATION OF CHALLENGE

A. Prior Art

The '366 patent claims priority to March 9, 2004. EX1001, (60). Without conceding entitlement to this date, all applied references qualify as prior art as of March 9, 2004.

Jeong[1] published July 7, 2003, and qualifies as prior art under 35 U.S.C. §102(a). EX1008, 0002, (22).

Suzuki issued May 11, 1999, and qualifies as prior art under §102(b). EX1009, [45].

Gibson was publicly available by at least September 2000, and is prior art under §102(b). EX1005, ¶¶37-43. Gibson was published by an established

[1] Citations are to the certified translation (EX1008).

publisher, CRC Press, with a 1999 copyright date. EX1005, ¶37; EX1010, 0007; *see VidStream LLC v. Twitter, Inc.*, 981 F.3d 1060, 1065 (Fed. Cir. 2020) ("established publisher"). The U.S. Copyright Office's record shows Gibson was published February 23, 1999. EX1016. Gibson had "been cataloged and indexed at the Library of Congress and made part of the OCLC bibliographic database, and at least by September 2000, when the physical copy was sent to [the Binding and Collections Care Division (BCCD)]." EX1005, ¶42.

Koo was filed April 14, 2003, published October 23, 2003, and qualifies as prior art under §102(a), (e). EX1011, (22), (43).

IEEE 802.16ab-01/01r2 (**802.16ab**) is an IEEE 802.16 working document dated September 28, 2001, that was publicly available by at least June 2002, and is prior art under §102(a), (b). EX1012, 0001 ("2001-09-28"); EX1003, ¶¶128-132; EX1006; EX1008, 0008; EX1016-EX1017; EX1030-EX1032.

802.16ab was a proposed amendment to the IEEE 802.16 standard. EX1012, 0001. The IEEE and its 802.16 working group were prominent and well-known to skilled artisans long before March 2004. EX1003, ¶129; EX1029, 99. The 802.16 working group had a publicly available website that included search functionality (general and by document number and author) for disseminating 802.16 working group materials, such as 802.16ab. EX1003, ¶129; EX1029, 99; EX1006, ¶¶4-6. Before March 2004, this website was prominent and well-known to skilled

artisans. EX1003, ¶129; EX1029, 99 ("the IEEE 802.16 Web site received over 2.8 million file requests in 2000"). Internet Archive captures confirm that 802.16ab was publicly available via the 802.16 working group's website by at least June 2002, and that there were a variety of ways to locate the document, including via the search functionality. EX1006, ¶¶4-10. For example, 802.16ab was available by at least June 18, 2002, on the 802.16 working group's "Task Group 3/4 Joint Documents" webpage, which could be located by following a few links starting on the 802.16 working group's homepage. EX1006, ¶¶8-10.

Jeong demonstrates that 802.16ab was publicly available by December 31, 2001, and is a "research aid" confirming 802.16ab's public availability. *See Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1350 (Fed. Cir. 2016). Jeong was filed December 31, 2001, and references "IEEE802.16ab-01/01r2," EX1008, 0002, 0008, demonstrating that skilled artisans exercising reasonable diligence could locate 802.16ab by at least Jeong's December 31, 2001 filing date. Jeong also published July 7, 2003, and its reference to "IEEE802.16ab-01/01r2" provides an "adequate roadmap" for skilled artisans to search for and locate 802.16ab. EX1003, ¶131.

Additional contemporaneous documents confirm that 802.16ab was publicly available before March 2004. The October 26, 2001 letter from Dr. Khun-Jush, ETSI Chairman, to Dr. Marks, IEEE 802.16 Chair, indicates that the HIPERMAN

group decided to adopt portions of 802.16ab, showing that ETSI—another well-known standards body—had accessed 802.16ab. EX1016; EX1003, ¶132; EX1006, ¶7. 802.16 working group documents show that 802.16ab was publicly available and actively being discussed in IEEE meetings in 2001. EX1030; EX1032, 3; EX1032, 3; *see also* EX1017, 0001 ("Date Submitted 2001-11-08"), 0002 ("The IEEE 80216ab-01_01r2 working document"), 0015 (reference [1], citing URL).

Chayat was filed March 4, 2003, published September 12, 2003, and claims priority to a U.S. provisional application filed March 7, 2002. EX1013, (22), (43), (30). Chayat is prior art under §102(a), (e).

If the '366 patent is not entitled to March 9, 2004, Jeong, Koo, and Chayat qualify as prior art under §102(b).

B. Obviousness Grounds

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

V. TECHNICAL BACKGROUND

A. OFDM & OFDMA

Orthogonal frequency-division multiplexing ("OFDM") and orthogonal frequency-division multiple access ("OFDMA") were well-known modulation and multiple-access techniques, respectively, by March 2004. EX1003, ¶¶48-52. OFDM is a modulation technique in which "information is spread over multiple subcarriers in the frequency domain and is transmitted after converting the information to the time domain using a Fourier transform." EX1013, 1:15-19. OFDM dates back at least to the 1960s, *see* EX1019, and Dr. Cimini has been an authority on OFDM since at least the 1980s, *see* EX1018.

OFDMA is a multiple-access technique based on OFDM. EX1013, 1:15-32. "The main difference between OFDM and OFDMA is that with OFDM a single transmitter uses a whole range of subcarriers to transmit its information, while in OFDMA different transmitters are assigned disjoint sets of subcarriers, and each user sends his information on the subcarriers assigned to him." *Id.*

B. Peak-to-Average Power Ratio

By March 2004, a well-known "disadvantage of employing OFDM for wireless applications is the potentially large peak-to-average power ratio (PAP) characteristic of a multicarrier signal with a large number of subchannels." EX1022, 1:39-42; *see also* EX1023, 1:31-40; EX1013, 2:8-9 ("Typically OFDM

systems produce high PAPR waveforms ….”); EX1010, 0073. As explained in Dr. Cimini’s patents, several solutions to reduce PAP in OFDM systems had been developed. EX1022, 1:50-2:58; EX1023, 1:41-2:9. One such known solution was to use complementary sequences or codes in conjunction with OFDM modulation. EX1013, 2:8-3:31; EX1003, ¶54.

VI. THE ’366 PATENT

A. Overview

The ’366 patent is directed to ranging in a multi-cell OFDMA wireless communication system. EX1001, 1:24-55. It admits that ranging was a well-known and “critical part of [a] wireless communication system.” *Id*. It admits that “a ***mobile station*** first needs to perform a ***random access*** for establishing communication with a ***base station***” and that “random access typically includes … ***Ranging***.”[2] EX1001, 1:24-26. “During Ranging, the mobile station sends a signal to the base station, so that the base station can identify the mobile station and measure the power and time delay of the mobile station, and inform the mobile station for power adjustment and time advance.” EX1001, 1:28-32; *see also* EX1003, ¶¶33-36.

[2] All emphasis added unless otherwise indicated.

The ’366 patent claims a mobile station and corresponding method (claims 1-8, 17-21) and a base station and corresponding method (claims 9-16, 22-24) that use a “ranging signal” exhibiting a low peak-to-average power ratio (commonly, “PAR” or “PAPR”) in the time domain. *See, e.g.,* EX1001, 7:21-22. The ranging signal is transmitted in a “ranging subchannel” comprising a block of subcarriers in which the power levels of the subcarriers at both ends of a block are set to zero, forming guard bands or intervals. *See, e.g.,* EX1001, 7:13-15, 7:23-26. During prosecution, the Examiner identified these two features (the low PAPR ranging signal and zero-power subcarriers) when allowing the claims. EX1003, ¶37.

B. Prosecution Summary

The application that issued as the ’366 patent received a first action allowance, i.e., was allowed without receiving rejections. EX1002, 0120-28. The Examiner’s reason for allowance was that the prior art of record, particularly U.S. Pub. No. 2010/0111017 (“Um”), failed to disclose Limitations 1.4 and 1.5:

> The prior art of record Um does not disclose the ranging signal lasts over a period of one or multiple orthogonal frequency division multiplexing (OFDM) symbols and the ranging signal exhibits a low peak-to-average power ratio in the time domain; and 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 as applied to independent claims 1, 9, 17 and 22.

EX1002, 0126.

The prior art and supporting evidence demonstrates that these features were well-known by March 2004, and that claims 1-24 were obvious. EX1003, ¶¶36, 53-54, 85-90, 169-177.

C. Level of Ordinary Skill in the Art

A person of ordinary skill in the art ("POSA") would have a bachelor's degree in electrical engineering, computer engineering, computer science, or an equivalent field, or an advanced degree in those fields, as well as at least 3-5 years of academic or industry experience in mobile wireless communications, or comparable industry experience. EX1003, ¶¶29-32, 42-43.

D. Claim Construction

No terms require express construction at this stage but Petitioner reserves the right to respond to any construction proposed by Patent Owner. EX1003, ¶¶44-45.

VII. GROUND 1: OBVIOUSNESS OVER JEONG & SUZUKI

Claims 1-4, 6-20, and 22-24 would have been obvious because the combination of Jeong and Suzuki teaches, suggests, or renders obvious each and every claim element, and a POSA would have been motivated to combine the references and reasonably expected success in doing so. EX1003, ¶¶57-107.

A. Jeong

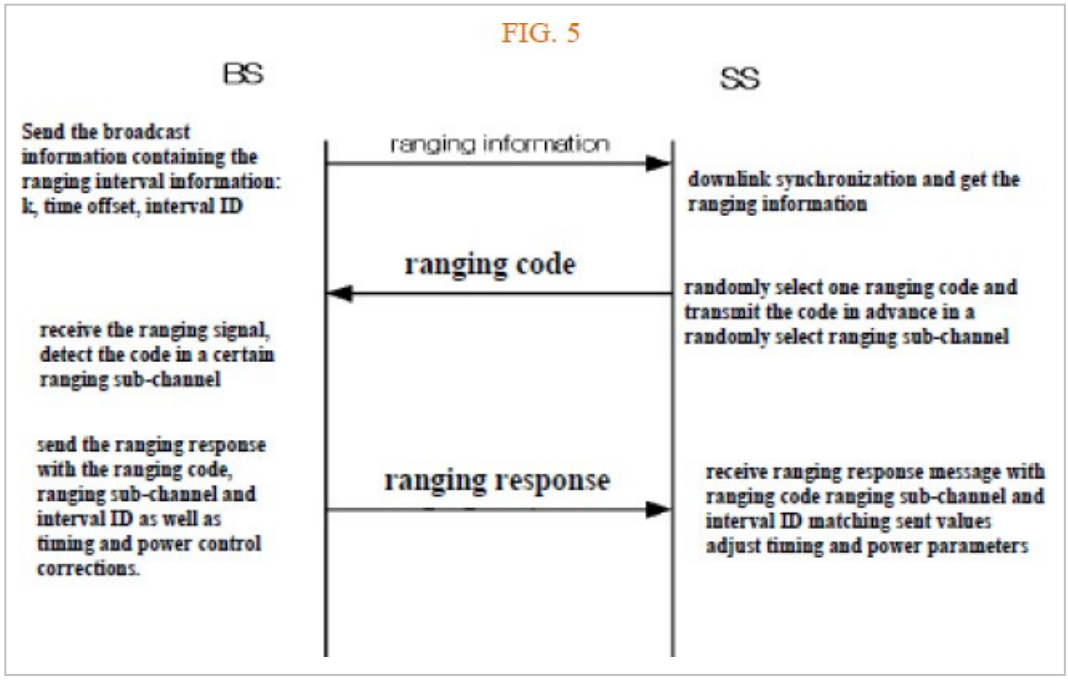
Jeong "relates to a method for ranging interval and ranging sub-channel allocation for initial ranging in a multi-user [OFDMA-]type wireless communication system in a point-to-multipoint broadband wireless access (BWA) system." EX1008, 0003; EX1003, ¶¶58-65. Jeong discloses an "OFDMA wireless communication system" in which "data can be transmitted between a base station ("BS") and a subscriber station ("SS")." EX1008, 0003. Jeong discloses "a cell" and "performing a cell plan," EX1008, 0004, 0007, which would have informed a POSA that Jeong discloses a cellular system, EX1003, ¶58.

Like the '366 patent, Jeong explains that "[r]anging in the OFDMA wireless communication system … periodically adjusts an accurate time offset between the base station and the subscriber station, and performs a power correction process." EX1008, 0003; *cf.* EX1001, 1:28-32. Jeong mentions "three types" of ranging, including "Initial," "Bandwidth Request," and "Maintenance," but focuses on initial ranging. EX1008, 0003-05.

Jeong explains that "initial ranging is performed in an initial state in which transmission power and time offset are not adjusted between the base station and the subscriber station." EX1008, 0004. "It enables the transmission of the SS with a predetermined power required in the OFDMA wireless communication system in a state being synchronized with symbol marking the start of the burst boundary."

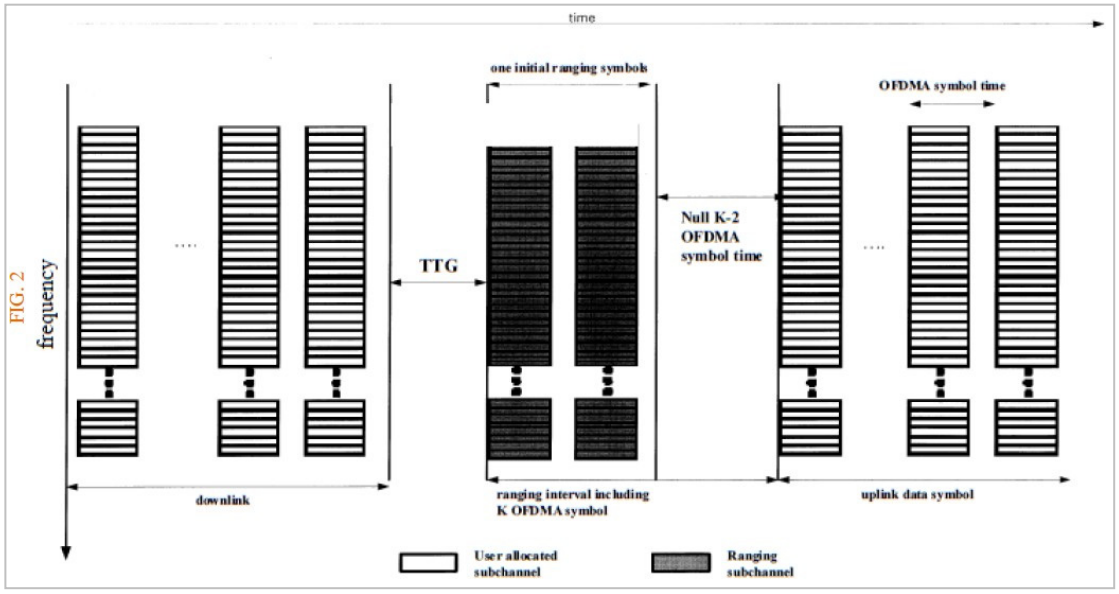
Id. Jeong describes a "procedure for performing such initial ranging … with reference to FIG. 5," *Id*.; *see also* EX1008, FIG. 5, 0009 (describing exchange between BS and SS during initial ranging).

As shown in Figure 5 below, the BS first "transmits system information necessary for initial ranging such as time offset, interval ID, and the like to the [SS]." EX1008, 0004. The SS then "randomly selects one ranging code with reference to the information for the initial ranging and transmits it to the base station." *Id*.; *see also id*. ("each user randomly selects one code from the binary code bank set as the ranging code, and transmits it through ranging sub-channel which is also randomly selected."). "When the [BS] detects a signal transmitted from the [SS], the [BS] transmits time control information and power control information to the [SS] using a code randomly selected." *Id*. Upon receiving the "ranging response," the SS "performs time adjustment and power control with reference to the time control information and power control information." *Id*.



EX1008, FIG. 5.

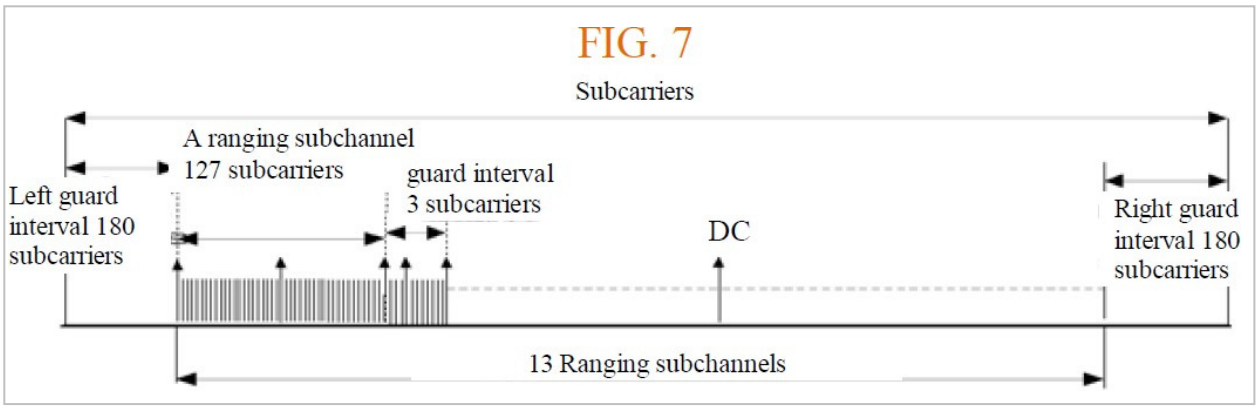
Jeong explains that there were different "channel structure[s]" in which the system can operate, including "the [frequency-division duplex (FDD)] mode" of Figure 1 and "the [time-division duplex (TDD)] mode" of Figure 2. EX1008, 0004. As shown, in the TDD mode, "a ranging signal section … and a signal section for data transmission are temporally separated," and the frequency band is divided into ranging subchannels during the ranging-signal section and into data (or user allocated) subchannels during data transmission. *Id*. Jeong focuses on the TDD mode. EX1008, 0004, 0008.



EX1008, FIG. 2.

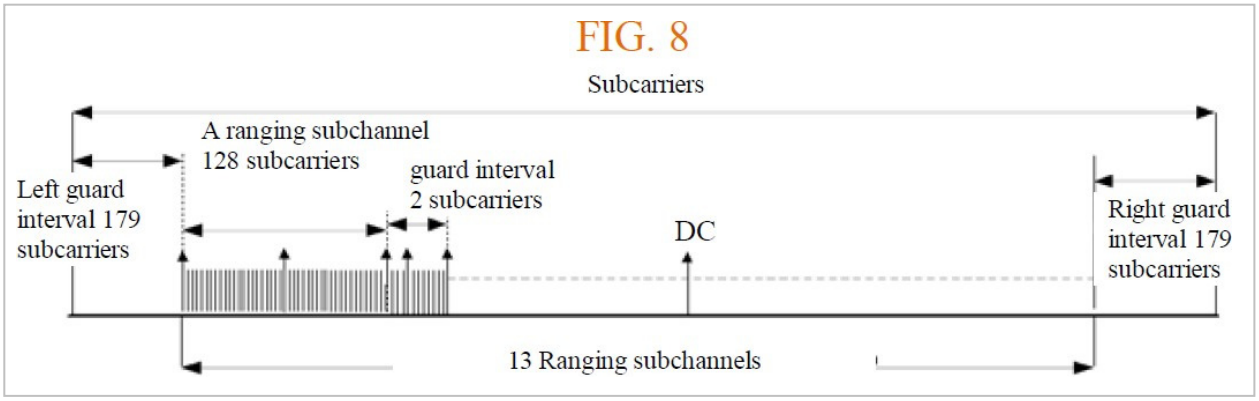
Joeng discloses ranging sub-channel allocation methods for an OFDMA wireless communication system in which (1) guard bands (or guard subcarriers) are provided between adjacent ranging sub-channels and (2) ranging sequences are used that provide low peak-to-average power. EX1008, 0008-09, FIGS. 7-8. Figure 7 of Jeong (below) illustrates a "2K mode with 180 guard intervals on the left and right sides of the ranging sub-channel structure." EX1008, 0008. This "ranging sub-channel allocation method" produces 13 ranging sub-channels each of which "consist[s] of 128 or 127 adjacent carriers" with "a guard interval" of two or three carriers "between adjacent ranging sub-channels." EX1008, 0008-09. "The ranging code used here is a [G]old code" where "63 gold codes" are produced using a

"[G]old sequence generator." EX1008, 0008. Jeong explains that the Gold codes provide "a low PAR." EX1008, 0009.



EX1008, FIG. 7.

Figure 8 of Jeong (below) illustrates another sub-channel allocation method in which, "as the ranging code, in addition to the Gold code, a Golay Complementary Sequence ('GCS') or an M sequence may be used." EX1008, 0009. The "ranging sub-channel allocation method" of Figure 8 produces 13 ranging sub-channels, each having 128 subcarriers, that are separated by guard intervals of two subcarriers. EX1008, 0009. OFDM-modulated GCS sequences exhibit low PAPR. EX1003, ¶64; EX1013, 2:26-29.



EX1008, FIG. 8.

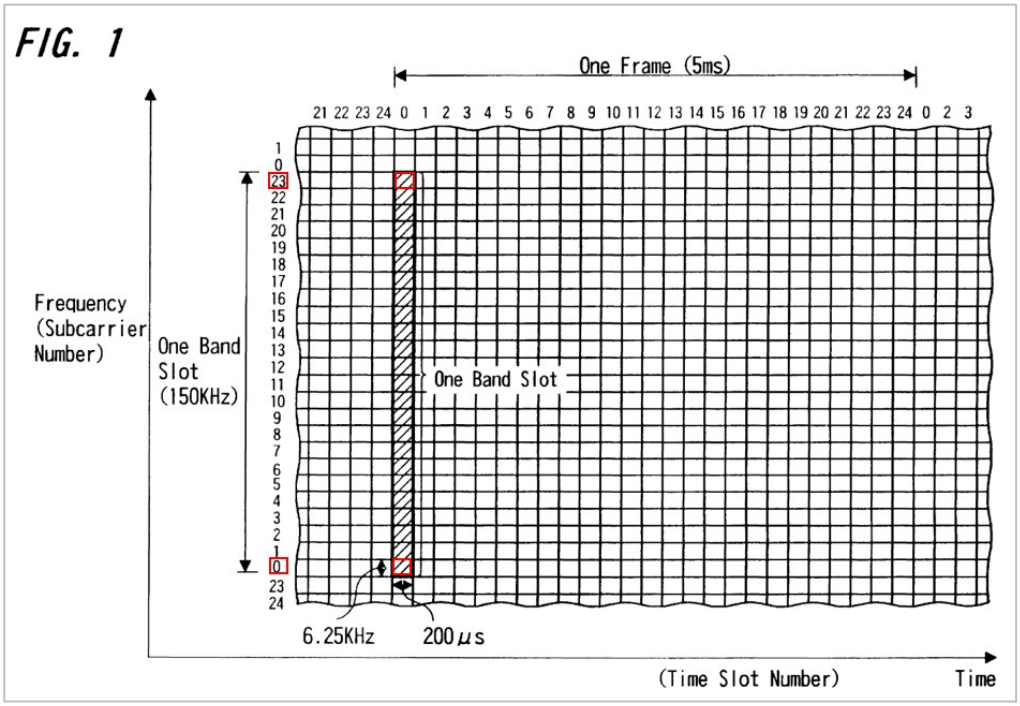
Jeong further discloses procedures for BS and SS operation during ranging. EX1008, 0009-10, FIGS. 10-12. Specifically, Figures 10-11 show a "procedure related to the BS ranging" and Figure 12 shows "operation of the SS according to the transmission and reception of the BS of FIGS. 10 and 11." *Id*.

B. Suzuki

Suzuki describes an OFDM-based "mobile communication" system, "such as a wireless telephone system or the like," that employs OFDMA. EX1009, 1:5-30 (describing OFDM), 2:57-30 (same), 3:31-4:34 (describing OFDMA), FIGS. 1-3; EX1003, ¶¶66-69. Suzuki describes the "wireless telephone system" as "a cellular system in which a base station is arranged in a predetermined condition to form a service area and communicate with a portable station (terminal device)," EX1009, 2:57-61, which was conventional by March 2004, EX1003, ¶66. Suzuki explains that a plurality of portable or mobile stations may communicate with a given base station in a given cell of the cellular system. EX1009, 3:31-4:21, FIGS. 2A-2G

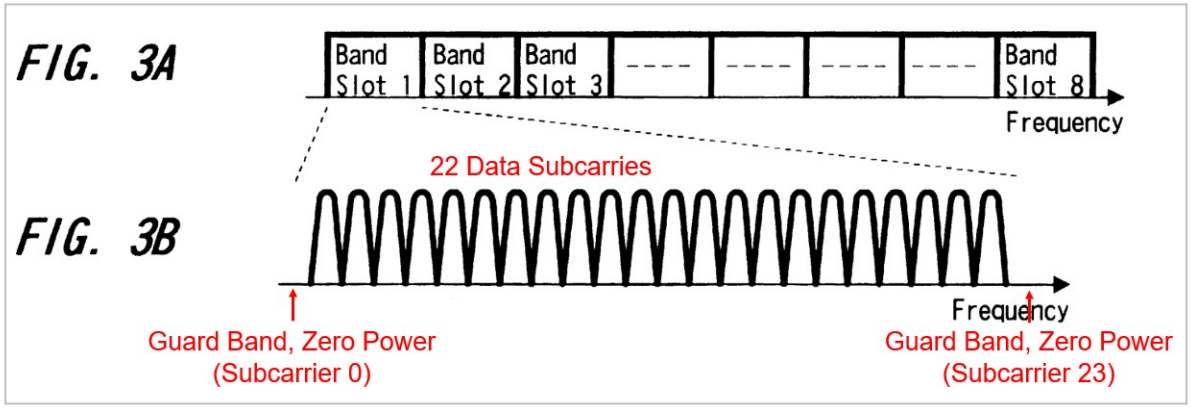
(describing and illustrating six portable stations communicating with a base station via OFDMA and TDMA). A POSA would have understood and found obvious that Suzuki's cellular system has a plurality of cells forming the system, and that each cell has a base station. *See* EX1009, 4:23-24 ("the cellular system where one cell is comprised of one base station"), EX1003, ¶66.

Figure 1 of Suzuki (below) shows an OFDM communication method. EX1009, 2:18-21, 2:64-3:30. Specifically, Figure 1 shows a grid having "a plurality of [OFDM] subcarriers [] successively arranged within a preallocated [frequency] band," where the grid's "vertical axis represents frequency" and "horizontal axis represents time." EX1009, 2:64-3:9. Suzuki discloses "one transmission band" or "band slot" as having "twenty-four subcarriers," such as subcarriers numbered 0 to 23 in Figure 1. EX1009, 3:5-16. Suzuki explains that only 22 of the subcarriers are available to carry information because "the subcarrier numbers 0 and 23 at both ends within one band slot," shown in red below, "are made guard bands in which no subcarrier is arranged and their powers are made zero." *Id*.; *see also* EX1009, 4:35-40 ("twenty-two subcarriers are arranged … for data transmission").



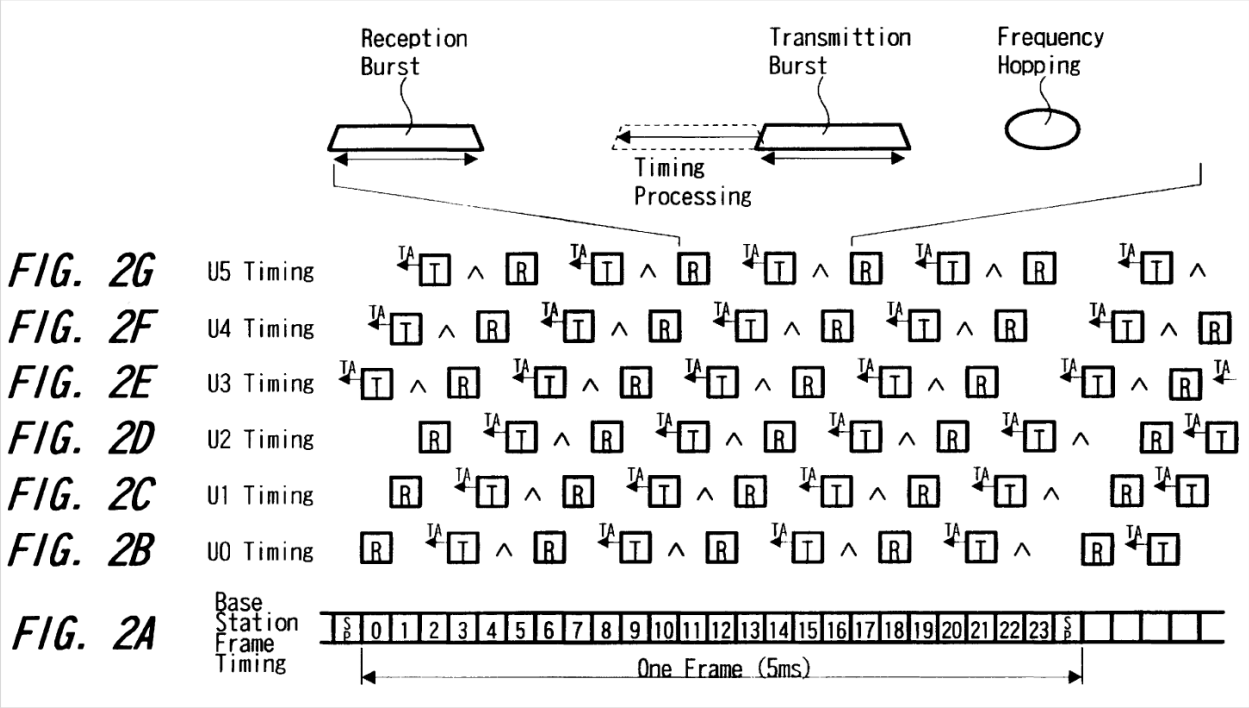
EX1009, FIG. 1 (annotated).

Figures 3A-3B of Suzuki (below) show another view of the 22 data subcarriers in a band slot, here with frequency plotted on the horizontal axis. EX1009, 4:35-57. The figure below has been modified to show Suzuki's zero-power subcarriers at both ends of the band slot. EX1009, 3:13-20.



EX1009, FIGS. 3A-3B (annotated).

Suzuki also discloses OFDMA "in which the cell station communicates simultaneously with a plurality of portable stations," which Suzuki illustrates in Figures 2A-2G (below). EX1009, 3:30-4:34. As shown, six portable stations simultaneously communicate with a base station in a given cell by assigning band slots (frequency) and time slots to each of the portable stations using a combination of OFDMA and TDMA techniques. *Id*.



EX1009, FIGS. 2A-2G.

C. Motivation to Combine

It would have been obvious to a POSA to use zero-power subcarriers at both ends of a group of subcarriers, as disclosed by Suzuki, in the guard intervals of the ranging sub-channel allocation methods disclosed by Jeong in order to reduce or

prevent interference between ranging sub-channels. EX1003, ¶70. In the methods of Figures 7 and 8, for example, Jeong discloses guard intervals/subcarriers at both ends of the frequency band as well as guard intervals/subcarriers "between adjacent ranging sub-channels." EX1008, 0008-09. Jeong explains that such guard subcarriers "prevent interference caused by using all carriers of a predetermined interval as ranging sub-channels as in the channel structure." EX1008, 0008. Jeong, however, does not describe the details of the guard subcarriers, which would have led a POSA to Suzuki's zero-power subcarriers. EX1003, ¶70.

A POSA would have been both motivated to make this combination and had a reasonable expectation of success in doing so because the combination requires no more than the predictable use of Suzuki's prior-art, zero-power subcarriers according to their established functions for Jeong's guard subcarriers. EX1003, ¶70. Indeed, inserting guard bands between frequency bands was a well-known technique used to reduce signal interference in wireless communication systems by 2004, EX1003, ¶¶50, 53, 55-56, and setting the guard-band subcarriers to zero power, as disclosed by Suzuki, would provide well-defined boundaries between blocks of subcarriers of Jeong's ranging sub-channels, EX1003, ¶71.

D. Independent Claim 1

1. Preamble (1.P)

The combination of Jeong and Suzuki renders obvious 1.P.[3] EX1003, ¶¶73-76. Jeong discloses an "OFDMA wireless communication system." EX1008, 0003-05, 0008-09. Jeong explains that "data can be transmitted between a base station ('BS') and a subscriber station ('SS')." EX1008, 0003, FIGS. 5, 10-12. Jeong discloses "a cell" and "performing a cell plan," EX1008, 0004, 0007, which would have informed a POSA that Jeong discloses a cellular system, EX1003, ¶73. By 2004, it was well-known and obvious for cellular systems to include more than one cell, and thus a POSA would have understood and found obvious that Jeong's system is a "*multi-cell*" system. EX1003, ¶73.

Jeong discloses that a cell has a BS. *See e.g.*, EX1008, 0007 ("for a given cell, the BS may know its own cell radius after performing a cell plan"). A POSA would have understood and found obvious that Jeong's system has "*a plurality of base stations*," at least one BS per cell. EX1003, ¶74.

Jeong discloses a plurality of SS that are "*configured to communicate with a serving base station in a cell via a communication channel*." *See, e.g.,* EX1008,

[3] See Claim Listing below.

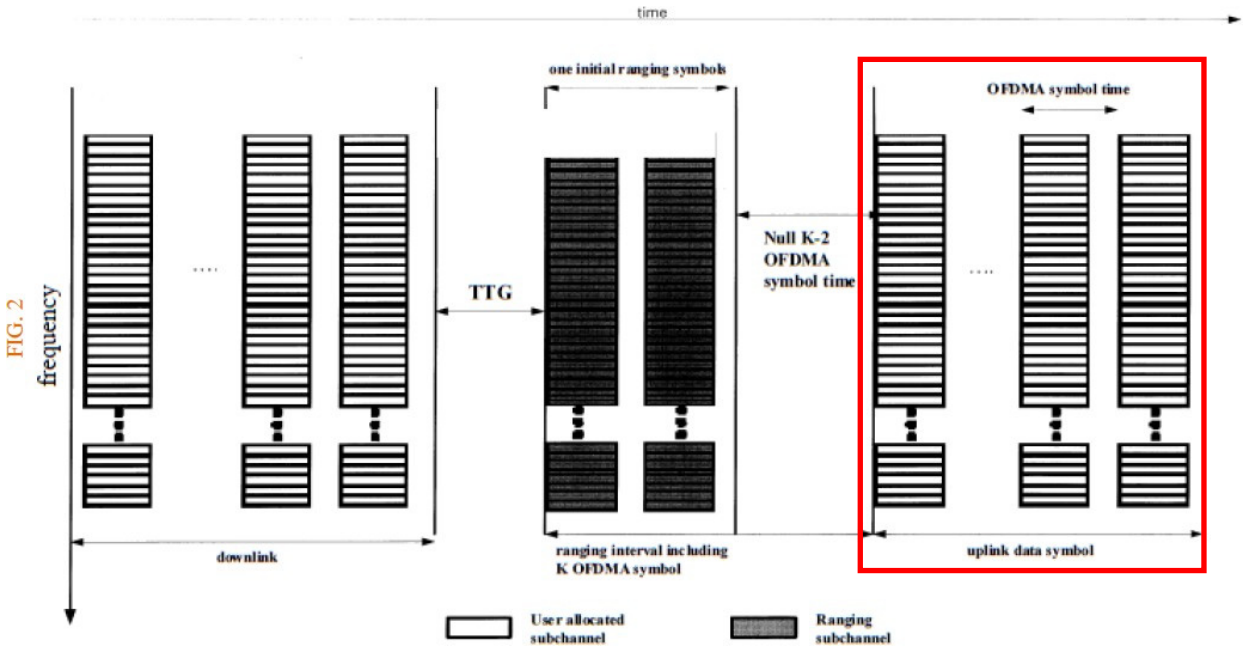
0004 (describing Figure 5), 0011 (describing Figure 12). Jeong, however, does not expressly disclose that the subscriber stations are "*mobile stations*."

Suzuki teaches this feature. EX1003, ¶¶75-76. Suzuki discloses an OFDM-based "mobile communication" system "such as a wireless telephone system" that comprises "portable stations." EX1009, 1:12-16, 3:31-4:4, FIGS. 2A-2G (showing six portable stations). A POSA would have understood that Suzuki's "portable station" is a "*mobile station*." EX1003, ¶76. It also would have been obvious for a "mobile … wireless telephone system" to have multiple cells. EX1003, ¶76. It would have been obvious 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. EX1003, ¶¶34, 76.

2. Limitation 1.1

Jeong teaches or suggests Limitation 1.1. EX1003, ¶¶77-78. Jeong discloses a "***data sub-channel***." EX1008, 0002 (abstract), 0007 ("when the BS processes the data sub-channel"), 0008 ("data sub-channels"), 0010 ("the data sub-channel"). Jeong discloses that, in the TDD mode "shown in FIG. 2, a ranging signal section … and a signal section for data transmission are temporally separated" such that "in the ***data signal transmission*** and reception section, a corresponding data transmission and reception operation can be performed." EX1008, 0004. Referring

to Figure 2, for example, a POSA would have understood that the "User allocated subchannel[s]" in the uplink (red below) are the data sub-channels in which an SS transmits a data signal to the BS. EX1003, ¶77; EX1008, 0010 (describing the BS receiving "general data being transmitted from the SS"), FIGS. 10 (step 1040), 11 (step 1140); *see also* EX1008, 0011 (describing "operation of the SS," including data signal transmission in step 1240 of Figure 12), FIG. 12. A POSA would have understood and found obvious that Jeong's SS includes "*an apparatus*" configured to transmit signals to the BS, including the data signal. EX1003, ¶77.



EX1008, FIG. 2 (annotated).

Jeong discloses that a sub-channel is a group of subcarriers. *See, e.g.*, EX1008, 0003 ("each OFDMA symbol is carried on a subcarrier and bundled into a predetermined sub-channel"), 0004 (describing "sub-channels" composed of 53

carriers"), 0008 (describing an "OFDMA wireless communication system having a capacity of 1696 carriers," which is "is divided into 32 basic data sub-channels … and each of the basic sub-channels is composed of 53 carriers"). As shown in Figure 2, the TDD mode includes "User allocated subchannel[s]" in the "uplink" that carry data signals from the SSs. EX1008, 0004, FIG. 2. Each "user allocated subchannel" includes a group or block of subcarriers in the frequency domain (e.g., 53 carriers), and thus Jeong's data sub-channel "*comprises a plurality of adjacent or non-adjacent subcarriers within the communication channel*." EX1003, ¶78.

3. Limitation 1.2

Jeong teaches or suggests Limitation 1.2. EX1003, ¶¶79-80. Jeong discloses, "After acquiring information being broadcasted by the BS to obtain information necessary for ***initial ranging***, the SS ***transmits a ranging signal to the BS using a ranging sub-channel*** and a ranging code randomly selected in a ranging interval section." EX1008, 0010; *see also* EX1008, 0004 ("the subscriber station randomly selects one ranging code with reference to the information for the initial ranging and transmits it to the base station"; "each user randomly selects one code from the binary code bank set as the ranging code, and transmits it through ranging sub-channel which is also randomly selected"), FIG. 2 (showing ranging sub-channels in the uplink). A POSA would have understood and found obvious that Jeong's SS

includes "*an apparatus*" configured to transmit signals to the base station, including the ranging signal. EX1003, ¶79.

Referring to Figure 12, Jeong discloses, "When system information for initial ranging is received in step 1260, the process proceeds to step 1270, and the SS transmits the ***ranging signal*** … by randomly selecting ***a ranging sub-channel and code to be used in a ranging code set*** and a ranging sub-channel set with a channel structure for the ranging signal so that the ranging signal can be detected in the BS ranging interval reception interval." EX1008, 0011, FIG. 12 (steps 1260-1270).

4. Limitation 1.3

Jeong teaches or suggests Limitation 1.3. EX1003, ¶¶81-84. Jeong discloses that "***the SS*** transmits the ***ranging signal, on which the IFFT has been performed*** … by randomly selecting a ranging sub-channel and ***code*** to be used in ***a ranging code set*** and a ranging sub-channel set with a channel structure for the ranging signal so that the ranging signal can be detected in the BS ranging interval reception interval." EX1008, 0011, FIG. 12. A POSA would have understood that "IFFT" means "Inverse Fast Fourier Transform," and that Jeong's ranging signal is "*formed*" by performing an IFFT on the ranging code that the SS selects from the ranging code set. EX1003, ¶81. Jeong discloses that a ranging code is a "*ranging sequence*," such as a "[G]old code" generated using a "[G]old ***sequence***

generator." EX1008, 0009 (further disclosing "Golay Complementary ***Sequence***"). Accordingly, Jeong's "*ranging signal is formed from a ranging sequence selected from a set of ranging sequences*." EX1003, ¶82.

Jeong discloses that "the BS sets a ranging interval section in consideration of the cell radius, ***determines*** the initial ranging sub-channel allocation method and ***the ranging code, and broadcasts it within its own cell***." EX1008, 0010; *see also* EX1008, 0004 (disclosing that he BS first "transmits system ***information necessary for initial ranging*** such as time offset, interval ID, and the like to the [SS]"; the SS then "randomly selects one ranging code ***with reference to the information for the initial ranging*** and transmits it to the [BS]."), 0011 (claim 2). Because each cell has a BS (which determines the ranging codes), a POSA would have understood and found obvious that Jeong's ranging codes are "*associated with the cell*" in which the BS resides. EX1003, ¶83.

A POSA would have further understood and found obvious that the ranging code is "*for identifying the mobile station*." EX1003, ¶84. Jeong discloses that, in the "ranging response," the BS transmits to the SS the ranging code originally sent by the SS. EX1008, FIG. 5 ("detect ***the code***"; "send the ranging response with ***the ranging code***"). A POSA would have understood and found obvious that the BS includes the original ranging code in the ranging response to direct the ranging

response to the SS that sent the particular ranging code, and thus the ranging code is "*for identifying the mobile station*." EX1003, ¶84.

5. Limitation 1.4

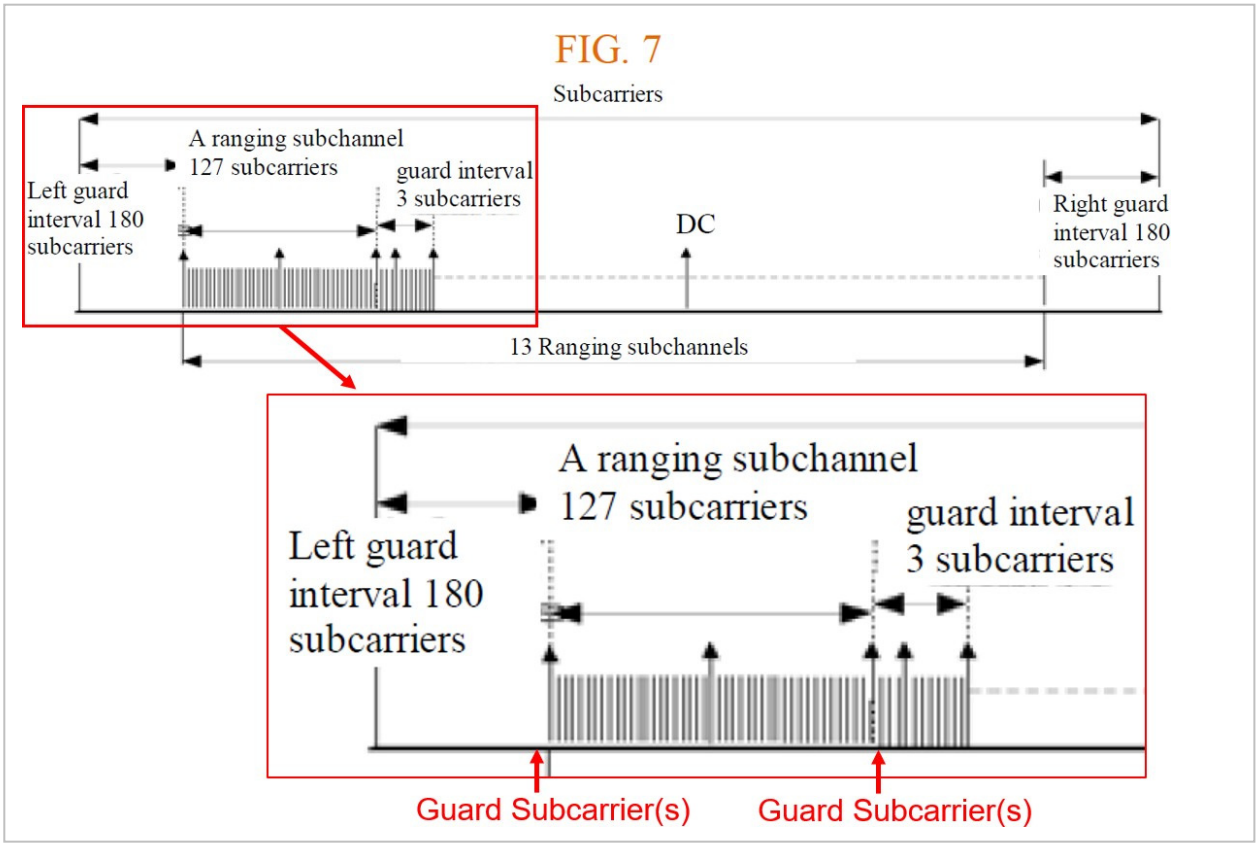
Jeong teaches or suggests Limitation 1.4. EX1003, ¶85. Jeong discloses that "the initial ranging uses a long ranging method in which an SS within the area of the BS is transmitted ***in two OFDM symbols*** when a new call is established with the BS." EX1008, 0004; *see also* EX1008, 0013 (claim 13). Jeong discloses ranging sub-channel allocation methods for an OFDMA wireless communication system that uses ranging sequences (e.g., Gold codes and Golay Complementary Sequences) that, when OFDM-modulated, exhibit low PAPR in the time domain. EX1008, 0008-09, FIGS. 7-8. For example, Jeong discloses that "[t]he ranging code used [in the method associated with Figure 7] is a [G]old code," and a "[G]old sequence generator … generates 63 gold codes" that, when OFDM-modulated, exhibit "***a low PAR***" in the time domain. EX1008, 0009; EX1003, ¶85.

6. Limitation 1.5

The Jeong-Suzuki combination renders obvious Limitation 1.5. EX1003, ¶¶86-90. The '366 patent does not define a "*block of subcarriers*" but Limitation 1.5 recites that the "*block*" is "*of subcarriers*," i.e., has plural subcarriers. EX1003, ¶86.

Jeong teaches or suggests that "*the ranging subchannel comprises at least one block of subcarriers within the communication channel*." EX1003, ¶87. For example, Jeong discloses "a ranging sub-channel consisting of 128 or 127 adjacent carriers." EX1008, 0008, FIG. 7; *see also* EX1008, 0009 (referring to Figure 8, disclosing that the "ranging sub-channel is 128 in length"). Jeong further discloses that, in the embodiment of Figure 7, guard intervals of 180 subcarriers on the left and right most portions of the frequency band, and "guard interval[s] between the [13] ranging sub-channels provides 2 subcarriers for a length of 128 ranging sub-channel and 3 subcarriers for a length of 127." EX1008, 0008, FIGS. 7-8.

The figure below, for example, shows the left most ranging sub-channel of Figure 7 of Jeong. The highlighted ranging sub-channel has 127 subcarriers used for signal transmission and is bounded, at both ends, by guard subcarriers. EX1008, 0008, FIG. 7; EX1003, ¶88. Jeong's 127 subcarrier ranging sub-channel is a "*block of subcarriers*." EX1003, ¶88. Alternatively, to 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*." EX1003, ¶88.



EX1003, ¶88 (annotating EX1008, FIG. 7).

The Jeong-Suzuki combination renders obvious that "*power levels of subcarriers at both ends of a block are set to zero*." In the methods of Figures 7 and 8, for example, Jeong discloses guard subcarriers at both ends of the frequency band as well as guard subcarriers "between adjacent ranging sub-channels." EX1008, 0008-09. Jeong explains that such guard subcarriers "prevent interference caused by using all carriers of a predetermined interval as ranging sub-channels as in the channel structure." *Id*. Jeong, however, does not describe the details of the

guard subcarriers, which would have led a POSA to Suzuki's zero-power subcarriers. EX1003, ¶89.

Suzuki discloses "one transmission band" or "band slot" as having "twenty-four subcarriers," such as subcarriers numbered 0 to 23 in Figure 1. EX1009, 3:5-16. Suzuki explains that only 22 of the subcarriers are available to carry information because "the subcarrier numbers 0 and 23 at both ends within one band slot, they are made guard bands in which no subcarrier is arranged and their powers are made zero." EX1009, 3:16-20. It would have been obvious to a POSA to use zero-power subcarriers at both ends of a group of subcarriers, as disclosed by Suzuki, in the guard intervals of the ranging sub-channel allocation methods disclosed by Jeong in order to reduce or prevent interference between ranging sub-channels, as explained above. EX1003, ¶90; Section VII.C.

E. Independent Claims 9, 17, 22

Independent claim 17 is a method corresponding to and reciting nearly identical limitations as the mobile station recited in claim 1. EX1003, ¶92. Claim 17 is thus obvious over the Jeong-Suzuki combination for the same reasons as claim 1. EX1003, ¶93; Section VII.D.

Independent claims 9 and 22 are directed to a base station and a method, respectively, for receiving (from a mobile station) data and ranging signals that are similar to those recited in independent claim 1. That is, claims 9 and 22 are

directed to a base station and method corresponding to the mobile station and method recited in claims 1 and 17, respectively. The base station and method of claims 9 and 17, however, require receiving the "*data signal from a **first** mobile station*" while receipt of the "*ranging signal [is] from a **second** mobile station*." EX1001, 7:60-67, 9:17-22 (Limitations 9.1/22.1 and 9.2/22.2). EX1003, ¶94.

Jeong discloses a BS for receiving the data and ranging signals transmitted by a plurality of SSs. EX1008, 0004-05, 0009-10, FIGS. 2, 5, 10-11. Jeong further discloses that, in TDD mode, the BS receives ranging and data signals from SSs in different time slots. Jeong, FIG. 2. A POSA would have understood and found obvious that Jeong's BS would receive a data signal from a first SS (e.g., during the uplink data transmission time) and receive a ranging signal from a second, different SS that was also being serviced by the BS (e.g., during the uplink ranging transmission time). EX1003, ¶95. The Jeong-Suzuki combination thus renders obvious Limitations 9.1/22.1 and 9.2/22.2, as well as the preambles and other limitations of claims 9 and 22 that are nearly identical to claims 1 and 17 for at least the reasons discussed above. EX1003, ¶95; Section VII.D.

F. Claims 2-3, 10-11

Jeong renders obvious the limitations of claims 2 and 10. EX1003, ¶¶96-97. Jeong discloses that "the BS sets a ranging interval section in consideration of the cell radius, ***determines the initial ranging sub-channel allocation method and the***

ranging code, and broadcasts it within its own cell." EX1008, 0010; *see also* EX1008, 0005-08, FIG. 4 (describing ranging in consideration of cell radius). Jeong discloses four "initial ranging sub-channel allocation methods" that have different ranging sub-channel configurations and that use different ranging sequences. EX1008, 0002 (abstract), 0008-09, FIGS. 6-9. For example, the allocation method of Figure 7 has "180 guard intervals on the left and right sides of the ranging sub-channel structure," "ranging sub-channel[s] consisting of 128 or 127 adjacent carriers," "guard interval[s] … between adjacent ranging sub-channels" of 2 or 3 subcarriers, and uses "[G]old codes." EX1008, 0008-09, FIG. 7. By contrast, the allocation method of Figure 8 has "179 guard intervals … provided on the left and right sides," ranging sub-channels "with a length of 128," guard intervals between adjacent ranging sub-channels of 2 subcarriers, and use GCS or M sequences. EX1008, 0009, FIG. 8.

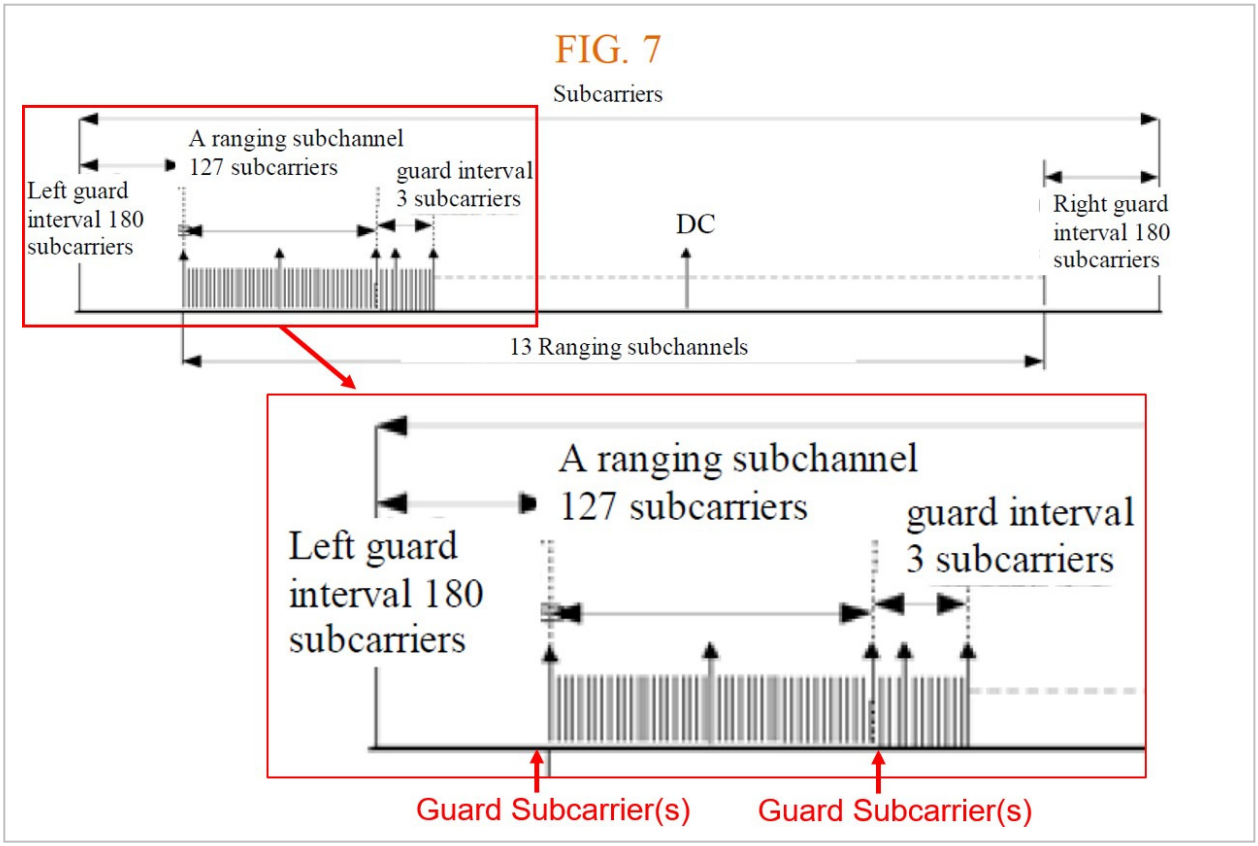
Jeong's disclosure of the BS determining the initial ranging sub-channel allocation method and of different allocation methods would have suggested and render obvious to a POSA that BSs in different cells would use different sub-carrier configurations, such as the allocation method of Figure 7 in a first cell and the allocation method of Figure 8 in an adjacent second cell. EX1003, ¶97. A POSA would have been motivated to do so in order to avoid interference between the adjacent cells, which was a well-known problem in wireless systems by March

2004. EX1003, ¶¶55-56, 97; *KSR*, 550 U.S. at 419-20 ("a known problem for which there was an obvious solution"). For example, the BS in the first cell would ignore ranging signals allocated according to the method of Figure 8. EX1003, ¶97.

Jeong similarly renders obvious the limitations of claims 3 and 11. EX1003, ¶98. Continuing the example above, the first cell would employ Gold codes (Figure 7) while the adjacent second cell would employ GCS or M sequences. EX1003, ¶98. The same motivation applies: a POSA would do so in order to avoid interference between adjacent cells. EX1003, ¶¶55-56, 98. For example, the BS in the first cell would ignore ranging signals formed using any sequence other than a Gold code. EX1003, ¶98.

G. Claims 4, 20

Jeong teaches the limitations of claims 4 and 20. EX1003, ¶99. For example, the figure below shows the leftmost ranging sub-channel of Jeong's Figure 7. The highlighted ranging sub-channel has 127 subcarriers used for signal transmission and is bounded, at both ends, by guard subcarriers, all of which are "*contiguous in frequency*." EX1008, 0008, FIG. 7.



EX1003, ¶99 (annotating EX1008, FIG. 7).

H. Claims 6-7, 18-19

The Jeong-Suzuki combination renders obvious claims 6 and 18. EX1003, ¶100. Suzuki discloses that the power levels of "the subcarrier[s] … at both ends within one band slot[] … are made zero," EX1009, 3:13-20, and the subcarriers at both ends are "*towards the high-end and low-end frequency boundaries of a block*," EX1009, FIGS. 3A-3B. Suzuki discloses that subcarriers "*towards the center of the block*" (e.g., subcarriers 1-22) carry information. EX1009, 3:16-17. Accordingly, in the combined Jeong-Suzuki system the zero-power subcarriers (at

high- and low-end frequency boundaries) have "*lower*" power than information-carrying subcarriers "*towards the center of the block*." EX1003, ¶100.

Similarly, the Jeong-Suzuki combination renders obvious claims 7 and 19. EX1003, ¶101. A POSA would have understood that Suzuki's zero-power "*boundary subcarriers of a block … are attenuated*" as compared to information-carrying subcarriers. *Id*. Accordingly, in the combined Jeong-Suzuki system Suzuki's "*attenuated*" or zero-power boundary subcarriers applied to Jeong's ranging sub-channel would "*reduce interference with other uplink signals when signal time misalignment occurs at the base station*." *Id*.

I. Claim 8

Jeong teaches or suggests "*wherein the ranging sequence is a binary or non-binary sequence*." EX1003, ¶102. Jeong describes a ranging code as a "***binary*** code." EX1008, 0004. Jeong discloses Gold, GCS, and M sequences, which are "*binary or non-binary sequence[s]*." EX1003, ¶102.

J. Claims 12-14

Jeong teaches or suggests the limitations of claim 12. EX1003, ¶103. Jeong discloses that the BS "detect[s] the [ranging] code" transmitted by the SS. EX1008, FIG. 5. Jeong discloses that "the BS detects a ranging signal from the SS ***by performing FFT*** with the ranging sub-channel structure." EX1008, 0010. Jeong discloses that "the ***BS detects the ranging code*** used by the SS by multiplying the

received ranging signal by each ranging code in the ranging code set." EX1008, 0010, FIG. 11. A POSA would have understood that Jeong's BS detects the ranging signal, performs FFT, and detects the ranging code in at least the frequency domain. EX1003, ¶103.

Jeong renders obvious the limitations of claims 13 and 14. EX1003, ¶104. Jeong discloses that "the BS detects the ranging code used by the SS by multiplying the received ranging signal by each ranging code in the ranging code set." EX1008, 0010. Dr. Cimini explains, "a POSA would have understood that the process Jeong discloses of multiplying the received ranging signal by each ranging code in the base station's ranging code set is describing matched filtering of claim 13, resulting in the required correlation of claim 14." EX1003, ¶104.

K. Claims 15-16, 23-24

Jeong teaches or suggests that the BS is configured to detect "*a time delay*" (claims 15, 23) and "*a power level*" (claims 16, 24) "*of the received ranging signal*" and to inform the SS that sent the ranging signal to adjust "*time transmission based on the detected time delay*" (claims 15, 23) and "*a power transmission based on the detected power level*" (claims 16, 24). EX1003, ¶¶106-107.

Jeong discloses, "When the base station detects a signal transmitted from the subscriber station, the base station transmits time control information and power

control information to the subscriber station using a code randomly selected. The subscriber station performs time adjustment and power control with reference to the time control information and power control information." EX1008, 0004, FIG. 5 (BS "send[s] … timing and power control corrections"). A POSA would have understood and found obvious that the BS would detect the time delay and power level of the ranging signal in order to determine and send "timing and power control corrections." EX1003, ¶¶106-107.

VIII. GROUND 2: OBVIOUSNESS OVER JEONG, SUZUKI, & GIBSON

Claims 2-3, 5, 10-11, and 21 would have been obvious over Jeong, Suzuki, and Gibson. EX1003, ¶¶108-119.

A. Gibson

Gibson is a comprehensive treatise on mobile communications that was published in 1999, titled *The Mobile Communications Handbook*. Gibson covers many mobile communication technologies that were well-known and routinely implemented by March 2004, including: pseudo-noise sequences, such as binary m-sequences, and Gold and Golay codes, EX1010, 0137-49 (chapter 8); cell design principles and channel assignment techniques, EX1010, 0406-22 (chapter 21), 0438-45 (chapter 23); and power control, EX1010, 0458-70 (chapter 25), among other topics. Gibson demonstrates that the features briefly covered in the '366

patent's detailed description but yet recited in claims 2-3, 5, 10-11, and 21 were well-known and obvious by March 2004. EX1003, ¶109.

B. Claims 2-3, 10-11

The Jeong-Suzuki-Gibson combination renders obvious claims 2 and 10. EX1003, ¶¶110-112. Jeong discloses that "the BS … ***determines the initial ranging sub-channel allocation method and the ranging code***, and broadcasts it within its own cell." EX1008, 0010.

Gibson teaches that "[i]n cellular communication systems, the service area is divided into cells, each covered by a single base station." EX1010, 0459. To avoid co-channel interference, "the channel frequency is usually not reused in adjacent cells in most of the cellular systems." EX1010, 0459. Gibson discloses that "a typical reuse pattern reuses the frequency in every seventh cell (frequency reuse factor = 1/7)." EX1010, 0459; *see also* EX1010, 439-440 (showing a seven-cell cluster in Figure 23.1), 0458 ("To minimize the cochannel interference, several techniques are proposed[, including] frequency reuse patterns, which ensure that the same frequencies are not used in adjacent cells").

Based on Gibson's teachings, it would have been obvious to use a different "*subcarrier configuration of the ranging subchannel*" in different cells, particularly in adjacent cells, in the Jeong-Suzuki system. EX1003, ¶112. For example, applying a frequency reuse factor of 1/7 to the Jeong-Suzuki system, the

ranging sub-channel(s) in each cell of a seven-cell cluster would be in different frequency bands, and thus have different subcarrier configurations. *Id*. A POSA would have been motivated to do so in order to minimize or avoid co-channel interference between adjacent cells, and would have reasonably expected success in making the combination because, as Gibson teaches, it was routine and conventional to configure adjacent cells to operate differently (e.g., use different frequency configurations) to avoid co-channel interference. *Id*.

The Jeong-Suzuki-Gibson combination similarly renders obvious claims 3 and 11. EX1003, ¶113. To avoid co-channel interference, as Gibson teaches, it would have been obvious to a POSA to use different sets of ranging sequences in different cells (such as different Gold codes or m-sequences), particularly in adjacent cells, in the Jeong-Suzuki system. *Id*. Using different codes to avoid interference and share resources is the basic principle behind code-division multiple access, which was well-known by March 2004, *see, e.g.,* EX1010, 0193-95, and thus a POSA would have reasonably expected success in using different sets of ranging sequences in different cells to avoid interference, EX1003, ¶113.

C. Claims 5, 21

The Jeong-Suzuki-Gibson combination renders obvious claims 5 and 21, which recite an "*open-loop power control method*" that was conventional by March 2004. EX1003, ¶¶114-119. Gibson teaches that "open-loop power control

estimates the channel and adjusts the transmitted power accordingly but does not attempt to obtain feedback information on its effectiveness," and shows the "principle operation of open-loop power control … in Fig. 25.1" (reproduced below). EX1010, 0460-61. The mobile station "estimates the channel by measuring the received power level of the pilot from the base station in the forward link and sets the transmitted power level inversely proportional to it." EX1010, 0460. Gibson explains that "[e]stimating the power of pilot is, in general, more reliable than estimating the power of the voice (or data) channel since the pilot is usually transmitted at higher power levels." EX1010, 0460-61.

Gibson also defines "Path loss" as a "[d]escription of the attenuation of signal power with distance from a transmitter." EX1010, 0456. Because of this relationship between path loss and signal power, a POSA would have understood and found obvious that estimating "the received power level of the pilot from the base station," as Gibson discloses, also estimates the path loss on the downlink (which Gibson refers to as the forward link, EX1010, 0459). EX1003, ¶116.

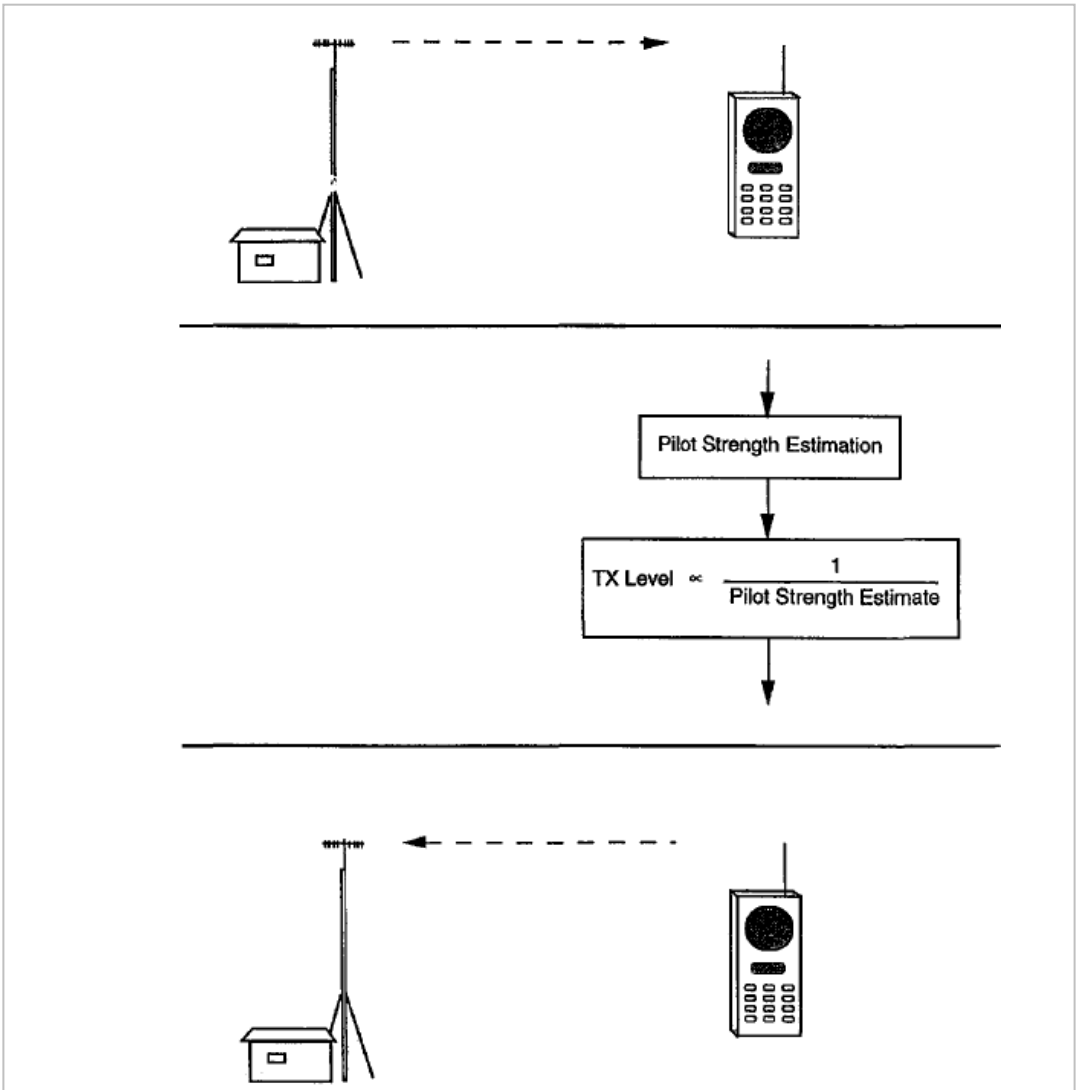


FIGURE 25.1 Reverse link open-loop power control.

EX1010, 0461.

As shown in Figure 25.1, Gibson thus discloses open-loop power control comprising (1) "*estimating a path loss between the serving base station and the mobile station based on a received downlink signal*," (2) "*setting the transmission power of the [] signal based on the path loss*," and (3) "*increasing the transmission*

power of the [] signal for retransmission" (as shown above, the lower the "Pilot Strength Estimate," the higher the mobile station's "TX Level"). EX1003, ¶117.

It would have been obvious to use Gibson's open-loop power control in the ranging process of the Jeong-Suzuki system for a number of reasons, including maintaining appropriate transmit power for reliable communication, conserving battery energy of the mobile station, and alleviating the near-far effect. EX1003, ¶118; EX1010, 0459. Addressing these known problems would have motivated a POSA to make the combination. EX1003, ¶118; *KSR*, 550 U.S. at 419-20 ("known problem").

Gibson also provides express teachings that would have motivated the combination. EX1003, ¶119. Gibson explains that a benefit of open-loop power control is that "it may be relatively fast" because "it does not have to wait for the feedback information." EX1010, 0460. Indeed, Gibson explains that open-loop power control is particularly suited for "TDD-based systems" in which "the forward and reverse link are highly correlated," EX1010, 0462-63, such as Jeong's system, EX1008, 0008 ("TDD mode"). In such systems, open-loop power control is both fast and accurate, EX1010, 0463, which would have motivated its use in the Jeong-Suzuki system. EX1003, ¶119. A POSA also would have reasonably expected success in the combination because it requires no more than the

predictable use of conventional open-loop power control according to its established function. EX1003, ¶199.

IX. GROUND 3: OBVIOUSNESS OVER KOO, 802.16AB, CHAYAT, & SUZUKI

Claims 1, 4, 6-9, 12, 15-20, and 22-24 would have been obvious because the Koo-802.16ab-Chayat-Suzuki combination teaches, suggests, or renders obvious each and every claim element, and a POSA would have been motivated to combine the references and reasonably expected success in doing so. EX1003, ¶¶120-192.

A. Koo

Koo describes "a ranging method for a mobile communication system using an OFDMA … scheme." EX1011, Abstract, ¶3; EX1003, ¶¶121-127. Like the '366 patent, Koo explains that "[a] communication system using the OFDMA scheme needs to periodically execute a ranging procedure to correctly establish a time offset between a transmission side, i.e., a Node B, and a reception side, i.e.[,] a UE (User Equipment), and to adjust power between them." EX1011, ¶5; *cf.* EX1001, 1:28-32. Koo's system is cellular, wherein each cell includes a Node B that can communicate with a plurality of UEs. *See* EX1011, ¶¶20, 23-25, 35, 37, 40-43, 50, FIG. 2; EX1003, ¶121. A "Node B" is a base station. EX1003, ¶121.

Koo discloses a "ranging procedure" that includes three processes: "an initial ranging process, a bandwidth request ranging process, and a maintenance

ranging process." EX1011, ¶6. Each process has different "objectives" that "have been defined in the IEEE[] 802.16" standard. EX1011, ¶8. The initial ranging process is for "UEs attempting to execute an initial access" to a Node B. *See* EX1011, ¶37.

Koo explains that the ranging procedures use "ranging sub-channels and [ranging codes (RCs)]." EX1011, ¶9. "Typically, one ranging channel is composed of two ranging sub-channels each having the length of 53 bits," and an "RC is created by segmenting a PN(Pseudorandom Noise) code having a prescribed length … in prescribed units." EX1011, ¶32, FIG. 1. UEs transmit the RCs over ranging sub-channels to the Node B. EX1003, ¶123.

Koo discloses that the "Node B generates a plurality of RCs by segmenting a PN code having the length of 2^{15-1} bits in predetermined units." EX1011, ¶40. "The Node B assigns RCs to be used for three ranging processes having different objectives, i.e. the initial ranging process, the bandwidth request ranging process, and the maintenance ranging process, to the three ranging processes, respectively." *Id*. "[T]he Node B assigns N number of RCs to the initial ranging process, assigns L number of RCs to the bandwidth request ranging process, and assigns M number of RCs to the maintenance ranging process[.]" *Id*. Koo provides an example in which "10 RCs are assigned with an initial ranging process" and "10 RCs are assigned with a bandwidth request ranging process and a maintenance ranging

process." EX1011, ¶37. The allocation of RCs to each ranging process may be based on the congestion state of the cell. EX1011, ¶¶41-43, FIG. 2.

After generating the RCs, the "Node B creates a UL_MAP message having [the] plurality of RCs classified according to ranging objectives" and "transmits the UL_MAP message" to the UEs. EX1011, ¶44; *id*., ¶10 ("The UL_MAP message is transmitted to all the UEs of a cell over broadcast data of the Node B.").

Koo explains that a UE receives the UL_MAP message and executes a ranging procedure according to its ranging objective. EX1011, ¶¶45-49, FIG. 3. For example, if the UE's "current ranging objective is the initial ranging objective," the "UE selects [] the initial RC and its backoff value from among the" RCs allocated for initial ranging. EX1011, ¶48; *see also* EX1011, ¶¶24 (explaining that "the reception sides [] select a RC"), 25 (same), 37 (describing UEs selecting an initial RC from a set of 10 initial RCs). The UE then attempts "uplink access with the selected RC." EX1011, ¶49.

Koo describes its mobile communications systems and methods in the context of the IEEE 802.16 standard, EX1011, ¶¶8-10, 33, and thus does not expressly describe certain well-known features and functionality, such as the details of ranging and data sub-channels. This would have led a POSA to published IEEE 802.16 documentation, such as 802.16ab. EX1003, ¶127.

B. 802.16ab

802.16ab is an IEEE 802.16 working document, *see* Section IV.A, that describes, among other things, OFDMA-based communications between subscriber stations ("SS") and base stations ("BS"), including OFDMA-based ranging. EX1012, 0015-16, 0077-90, 0107-08, 0173-210; EX1003, ¶¶128-140.

802.16ab provides a frequency-domain description of OFDM/OFDMA that mirrors the '366 patent, or vice versa. *Compare* EX1012, 0175-76, FIG. 215, *with*, EX1001, 2:57-3:16, FIG. 1. For example, 802.16ab explains that an "OFDM symbol is made up from carriers" and describes three carrier types: "Data carriers - for data transmission"; "Pilot carriers - for different estimation purposes"; and "Null carriers - no transmission at all, for guard bands and DC carrier." EX1012, 0175; *cf.* EX1001, 2:64-3:4. "[G]uard bands … enable the signal to naturally decay and create the FFT 'brick wall' shaping." EX1012, 0175. EX1003, ¶133.

802.16ab also explains that a "symbol is divided into logical sub-channels to support scalability, multiple access, and advanced antenna array processing capabilities." EX1012, 0175; *cf.* EX1001, 3:5-6. 802.16ab further explains that "[t]he carriers forming one subchannel may, but need not be adjacent" and "[i]n the OFDMA mode, only part of all active carriers may be used by the transmitter." EX1012, 0175, FIG. 215; *cf.* EX1001, 3:6-8, FIG. 1. Figure 215 of 802.16ab shows three example OFDMA sub-channels:

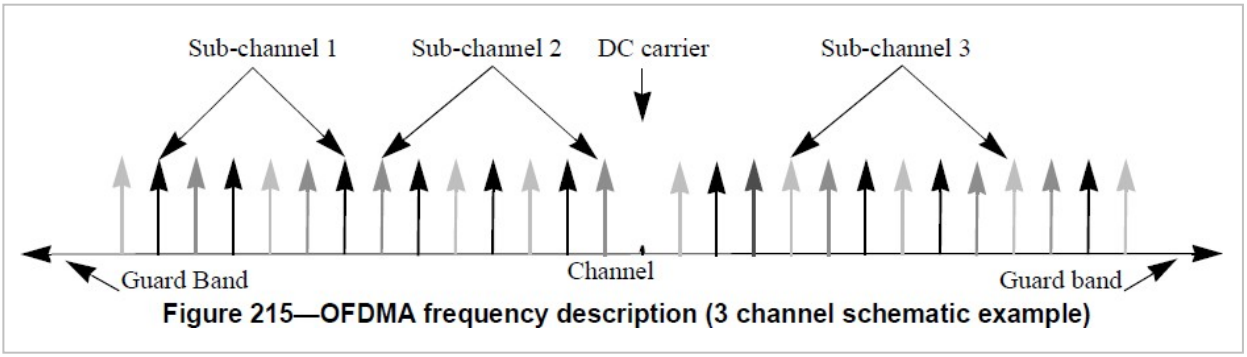


Figure 215—OFDMA frequency description (3 channel schematic example)

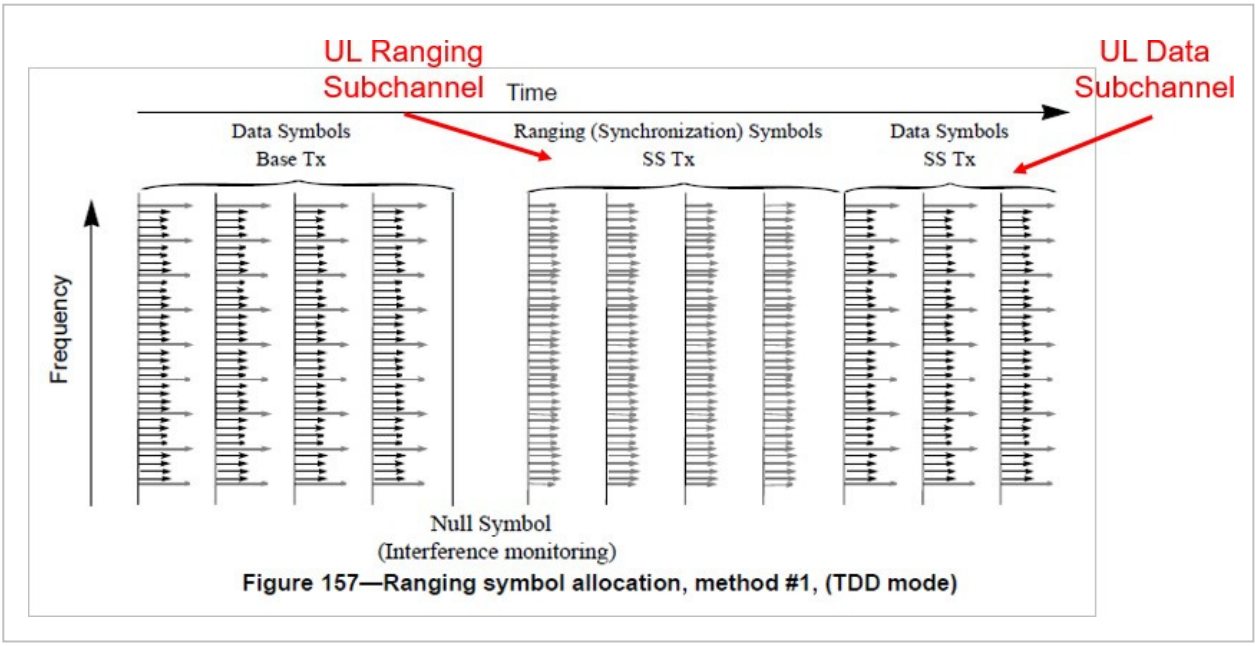
EX1012, 0175; *cf.* EX1001, FIG. 1.

802.16ab also discloses OFDMA-based ranging. *See, e.g.,* EX1012, 0086-91, 0205-07. Like the '366 patent and Koo, 802.16ab explains that "ranging is the process of acquiring the correct timing offset and power corrections such that the SS's transmissions are aligned to a symbol that marks the beginning of a burst(s)boundary with the required power." EX1012, 0088; *cf.* EX1011, ¶5; EX1001, 1:28-32; *see also* EX1012, 0204-07 (describing OFDMA-based ranging in Section 8.3.5.3.4.3.1).

802.16ab explains that "[o]n network entry … the SS that whishes [*sic*] to perform ranging must select randomly a Ranging Code (Long or Short), which will be transmitted on a Ranging Sub-Channel in a randomly chose OFDMA symbol." EX1012, 0088; *see also id.*, 0088-90 (describing OFDMA-based ranging in Section 6.2.7.10.4.1). "The Long Ranging transmission shall be used by any SS that wants to synchronize to the system channel for the first time." EX1012, 0205. 802.16ab explains that "Long Ranging transmission shall be performed during the

two first consecutive symbols of the UL frame. The same ranging code is transmitted during each symbol." EX1012, 0205. 802.16ab further discloses that "[s]ending for a consecutive period of two OFDMA signals a preamble shall perform the long ranging transmission," where "[t]he preamble structure is defined by modulating one Ranging Code, up on the Ranging Sub-Channel carriers." EX1012, 0205.

802.16ab discloses "upstream access schemes" for ranging, including a first scheme in which "[e]ach OFDMA (OFDM)symbol will carry either data or ranging slots," which is shown in Figure 157. EX1012, 0086-87. 802.16ab explains that "[t]he basic OFDMA allocation unit" is a "slot," which "is a combination of a time symbol and a sub-channel." EX1012, 0086; *see also* EX1012, 0077 ("OFDMA Slot Definition"). The first access scheme creates ranging and data subchannels in the uplink (UL) based on time division. EX1003, ¶137.



EX1012, 0087 (annotated).

Figure 160 of 802.16ab illustrates message exchange between SS and BS using the first access scheme. EX1012, 0089. Figure 160 shows, among other things, that the SS randomly selects and transmits a ranging code in a randomly selected ranging slot to the BS. *Id*. The BS, in turn, transmits a ranging response to the SS that includes, among other things, the original ranging code and ranging slot. *Id*. The randomly selected ranging code identifies the SS. EX1003, ¶138. That is, BS includes the original ranging code in the ranging response to direct the ranging response to the SS that sent the particular ranging code. *Id*.

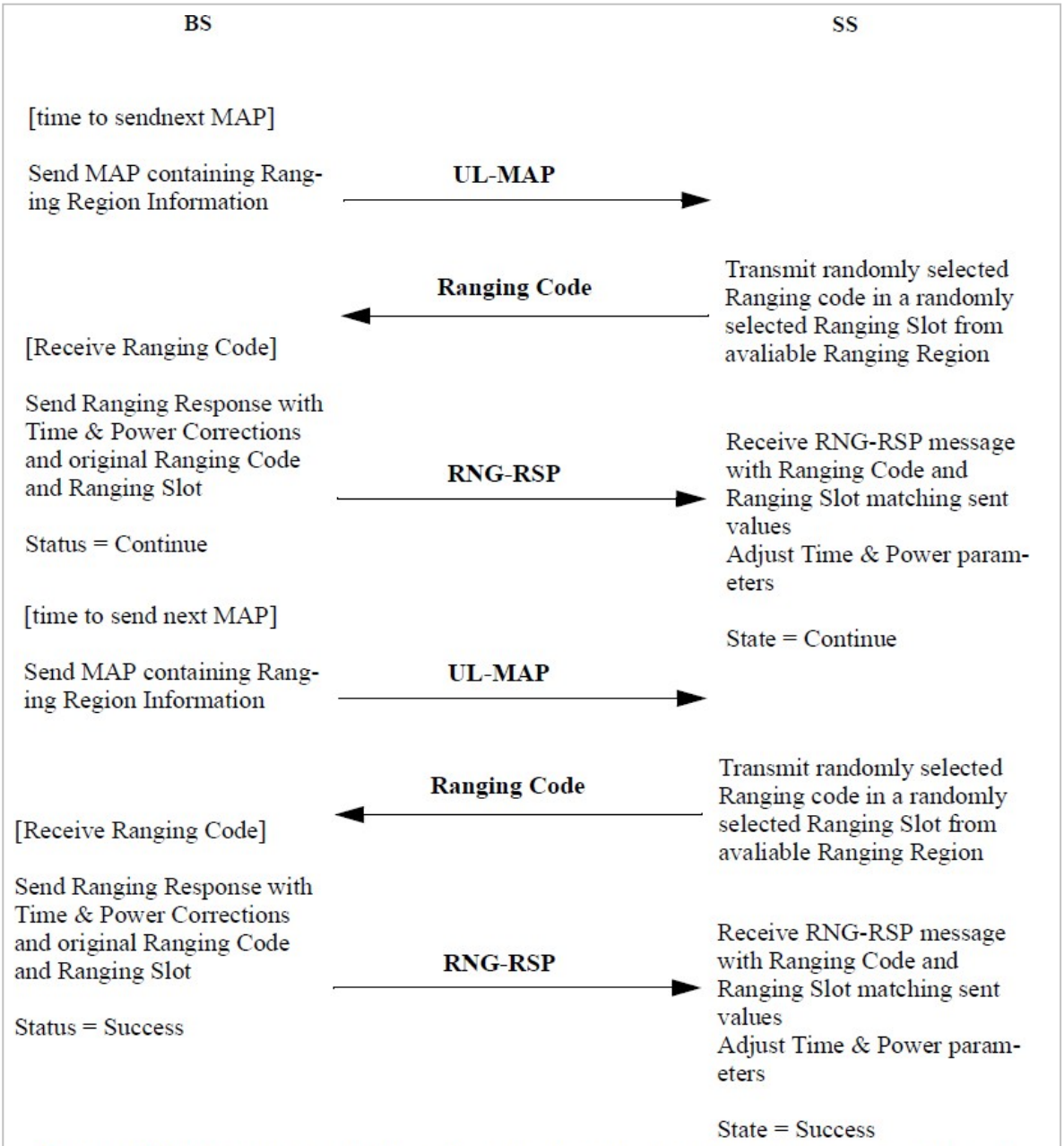


Figure 160—Ranging and automatic adjustments procedure for access scheme 1.

EX1012, 0089.

802.16ab discloses a second scheme in which "[e]ach OFDMA (OFDM)symbol will carry both data and ranging slots," which is shown in Figures 158 and 159 below. EX1012, 0086. Figure 158 shows a "Ranging subchannel" is

allocated in the portion of the frequency band, and "User allocated subchannel[s]" are allocated in other portions of the frequency band. EX1012, 0087. Data is transmitted in the user allocated subchannels. EX1003, ¶139. In Figure 161, 802.16ab illustrates message exchange between SS and BS during the second access scheme. EX1012, 0090.

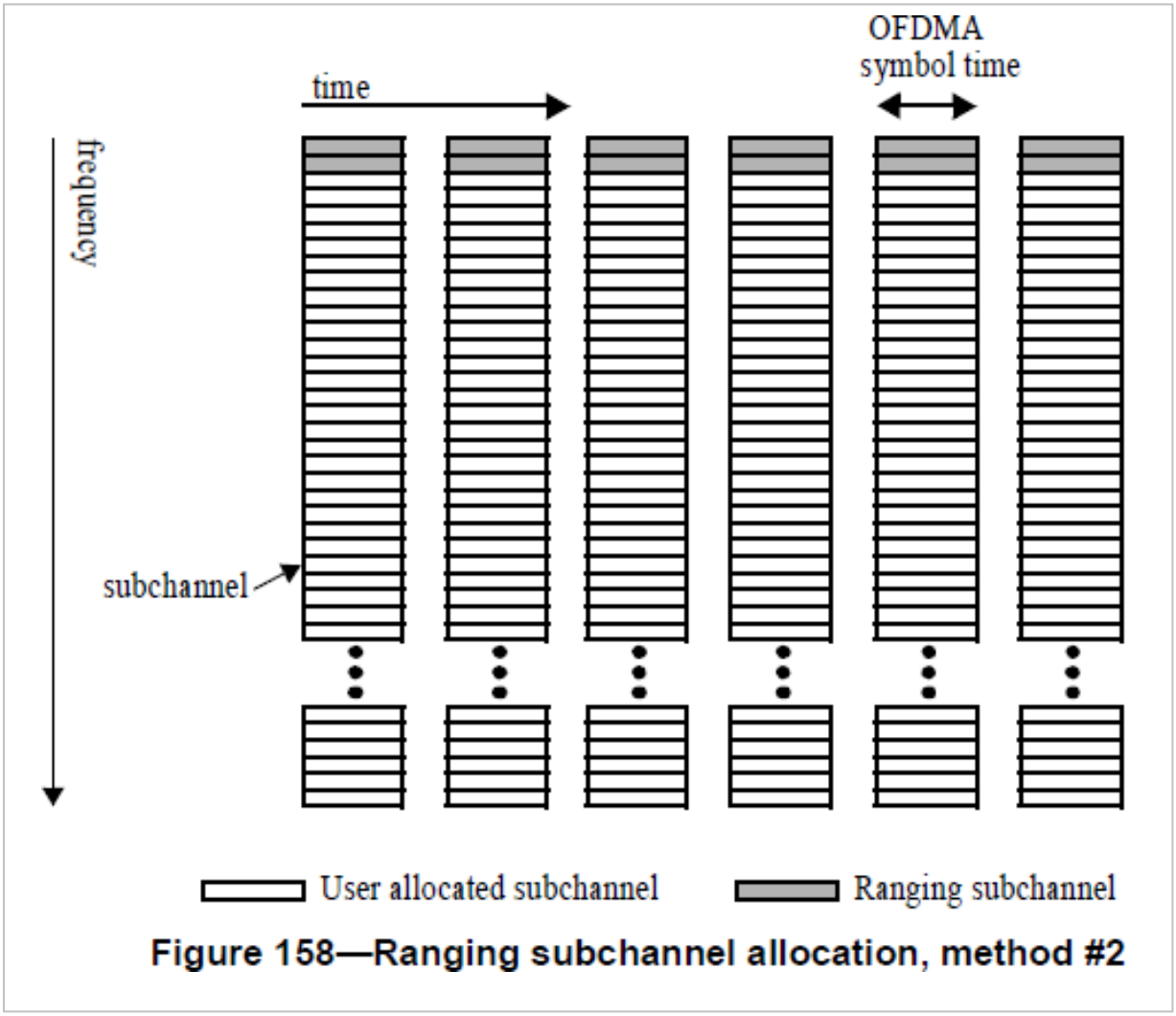


Figure 158—Ranging subchannel allocation, method #2

EX1012, 0087.

802.16ab discloses that "a ***preamble*** shall perform the long ranging transmission," EX1012, 0205, and that "OFDM can incorporate ***peak-to-average reduction signal processing*** to partially (but not completely) alleviate its high sensitivity to power amplifier nonlinearities," EX1012, 0127-28; *see id.*, 0107. 802.16ab, however, does not expressly describe processing techniques to reduce PAPR, which would have led a POSA to Chayat. EX1003, ¶140.

C. Chayat

Chayat describes "OFDMA systems with enhanced preamble properties" that "utilize preambles with a low Peak-to-Average Power ratio (PAPR) property." EX1013, Abstract; EX1003, ¶¶141-142. Chayat explains that "[t]ypically OFDM systems produce high PAPR waveforms," EX1013, 2:8-9, and some prior-art techniques sought to "achieve low PAPR property for the data portion of the [OFDM] signal rather than for the preamble, EX1013, 2:29-36. But, "[b]y using as a preamble[] a carefully crafted set of subcarrier modulation values," Chayat teaches that "the PAPR of the preamble can be kept at about 3 dB …." EX1013, 2:11-13. Chayat explains that using such preambles is beneficial because (1) it "avoid[s] excessive distortion in the power amplifier," EX1013, 2:4-6, and (2) "result[s] in a more accurate [channel] estimate," EX1013, 2:13-15; *see also* EX1013, 5:11-14.

Accordingly, Chayat discloses "sets of preambles satisfying good PAPR properties in OFDMA systems," using, for example, "Golay's complementary sequences." EX1013, 4:9-19; *see also* EX1013, 6:1-14.

D. Suzuki

See Section VII.B.

E. Motivation to Combine

1. Koo with 802.16ab

It would have been obvious to a POSA to combine 802.16ab's OFDMA-based ranging techniques, including the allocation of data and ranging sub-channels, with Koo's mobile communication system. EX1003, ¶¶144-145. Koo provides express teachings that would have motivated a POSA to make this combination. EX1003, ¶144. For example, Koo states that "[t]he ranging procedure needs ranging sub-channels and [ranging codes (RCs)]," EX1007, ¶9, and describes an OFDMA communication system in the context of the IEEE 802.16 standard, EX1007, ¶¶8, 9, 33. Koo's references to the IEEE 802.16 standard would have motivated a POSA to look to publicly available IEEE 802.16 documents describing OFDMA-based ranging, which would have led to 802.16ab. EX1003, ¶144.

A POSA would have had a reasonable expectation of success in making this combination because Koo's system is based on IEEE 802.16, and thus a POSA

would have expected that combining techniques described in contemporaneous IEEE 802.16 documents (such as 802.16ab) with Koo's system would yield predictable results. EX1003, ¶145.

2. Koo-802.16ab with Chayat

It would have been obvious to a POSA to combine Chayat's low-PAPR preamble sequences with the combined Koo-802.16ab system in order to reduce PAPR during ranging. EX1003, ¶¶146-149. First, 802.16ab provides teachings that would have motivated a POSA to make the combination. For example, 802.16ab discloses that "a preamble shall perform the long ranging transmission," EX1012, 0205, and that "OFDM can incorporate peak-to-average reduction signal processing to partially (but not completely) alleviate its high sensitivity to power amplifier nonlinearities," EX1012, 0127-28. But 802.16ab does not describe specific PAPR-reduction techniques, which would have led a POSA to look to Chayat's disclosure of preamble sequences having low PAPR. EX1003, ¶146.

Second, Chayat also provides teachings that would have motivated the combination. To start, Chayat describes OFDMA systems based on IEEE 802.16, EX1013, 1:29-32, 3:19-21, which would have motivated a POSA to use Chayat's sequences in an IEEE 802.16 system, such as the combined Koo-802.16ab system. EX1003, ¶147. Chayat also teaches that using preamble sequences with low PAPR "avoid[s] excessive distortion in the power amplifier," EX1013, 2:3-6, and that

"[b]y using as a preamble, a carefully crafted set of subcarrier modulation values, the PAPR of the preamble can be kept at about 3 dB, significantly less than the values typical to data. This property is beneficial in that during the channel estimation phase the signal experiences smaller distortion, resulting in a more accurate estimate," EX1013, 2:11-15. Chayat's teachings would have motivated a POSA to use Chayat's sequences in the combined Koo-802.16ab system in order to (1) avoid excessive distortion in the power amplifier and (2) obtain more accurate channel estimations. EX1003, ¶147.

Third, that OFDM signals exhibited high PAPR was a well-known problem that had known solutions by March 2004. Section V.B; EX1003, ¶148; *see KSR*, 550 U.S. at 419-20 ("a known problem for which there was an obvious solution"). One such known and obvious solution is disclosed by Chayat: generating and using preambles that have low PAPR. EX1013, 4:4-19.

A POSA would have reasonably expected success in making this combination. EX1003, ¶149. Chayat's references to IEEE 802.16 demonstrate that Chayat's system and method are compatible with IEEE 802.16, and their combination would yield predictable results. *Id*. Further, each of Koo, 802.16ab, and Chayat describe similar OFDMA-based communication systems, which were known to exhibit high PAPR. *Id*. A POSA would thus have reasonably expected

that using Chayat's preamble sequences would predictably result in reducing PAPR, as Chayat expressly teaches. *Id*.

3. Koo-802.16ab-Chayat with Suzuki

It would have been obvious to combine Suzuki's zero-power guard bands with the Koo-802.16ab-Chayat system in order to reduce interference between groups of subcarriers. EX1003, ¶¶150-151. 802.16ab provides express teachings that would have motivated the combination, explaining that "[a]n OFDM symbol is made up from carriers," which may include "[n]ull carriers" that have "no transmission at all, for guard bands and DC carrier." EX1012, 0175. 802.16ab further teaches that "guard bands … enable the signal to naturally decay and create the FFT 'brick wall' shaping." EX1012, 0175. These teaching 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). EX1009, 3:17-20.

Additionally, inserting guard bands between frequency bands was a well-known technique used to reduce signal interference in cellular communication systems by 2004. EX1003, ¶151. As such, employing Suzuki's zero-power guard bands in the Koo-802.16ab-Chayat system represents nothing "more than the predictable use of prior art elements[, Suzuki's zero-power guard bands,] according to their established functions[, reducing signal interference]." *See KSR*,

550 U.S. at 417. EX1003, ¶151. Because they were well-known and commonly used, a POSA would have had a reasonable expectation of success in combining Suzuki's guard bands in the Koo-802.16ab-Chayat system. *Id*.

F. Independent Claim 1

1. Preamble 1.P

Koo teaches or suggests Claim 1's preamble. EX1003, ¶¶153-155. Koo teaches or suggests "*[i]n a multi-cell orthogonal frequency division multiple access (OFDMA) wireless communication system*." EX1003, ¶153. Koo discloses a "mobile communication system using an OFDMA … scheme." EX1011, Title, Abstract, ¶3. Koo discloses that the system is a cellular communication system. *See, e.g.*, EX1011, ¶¶20 ("cell status"), 23 ("a current cell"), 40 ("the Node B checks its own cell status"), 41 ("any cell"; "this cell"). A POSA would have understood and found obvious that Koo's cellular system is a "*multi-cell*" system. EX1003, ¶153. It was conventional by March 2004 for cellular systems to include more than one cell. EX1003, ¶153.

Koo teaches or suggests that the OFDMA system comprises "*a plurality of base stations and mobile stations*." EX1003, ¶154. Koo discloses a "number of UEs attempting to execute an initial access" with a "Node B" in a given cell. EX1011, ¶37; *see also* EX1011, ¶¶5 ("Node B" and "UE (User Equipment")), 10 ("all the UEs of a cell"), 35 (describing a "small" or "large" "number of UEs are

interconnected"), 40-41, FIG. 2. Koo discloses a "mobile" communication system, EX1011, Title, Abstract, ¶3, and thus a POSA would have understood and found obvious that Koo's UE is a "*mobile station*," EX1003, ¶154. Koo's "Node B" refers to a "*base station*," and, in a cellular system, each cell includes a base station (thus Koo's system has plural base stations). EX1003, ¶154.

Koo teaches or suggests "*a mobile station configured to communicate with a serving base station in a cell via a communication channel*." EX1003, ¶155. Koo discloses that in an "OFDMA scheme" data and ranging information are transmitted as "OFDMA symbols [that] are separately loaded on [frequency] sub-carriers and transmitted over prescribed sub-channels," EX1011, ¶5, such as "ranging sub-channels" during the "ranging procedure," EX1011, ¶9. Koo discloses that during the ranging procedure, UEs select and transmit ranging codes to the Node B. EX1011, ¶¶46-49, FIG. 3.

Alternatively, the Koo-802.16ab-Chayat-Suzuki combination renders obvious claim 1's preamble. EX1003, ¶156. 802.16ab teaches a "*multi-cell*" system and "*base stations*." EX1012, 0015 ("base station"; "multiple- cell frequency reuse systems"), 0096 ("Base Stations"), 0271 ("multiple cell system"), 0170. Each cell in a multi-cell system has a base station. EX1003, ¶156. Suzuki discloses a "wireless telephone system," such as "a cellular system in which a base station is arranged in a predetermined condition to form a service area and

communicate with a portable station (terminal device)." EX1009, 2:57-61. Suzuki discloses that a plurality of portable ("*mobile*") stations may communicate with a base station in a given cell of the system. EX1009, 3:31-4:21. A POSA would have combined Koo, 802.16ab, Chayat, and Suzuki as discussed above. Section IX.E.

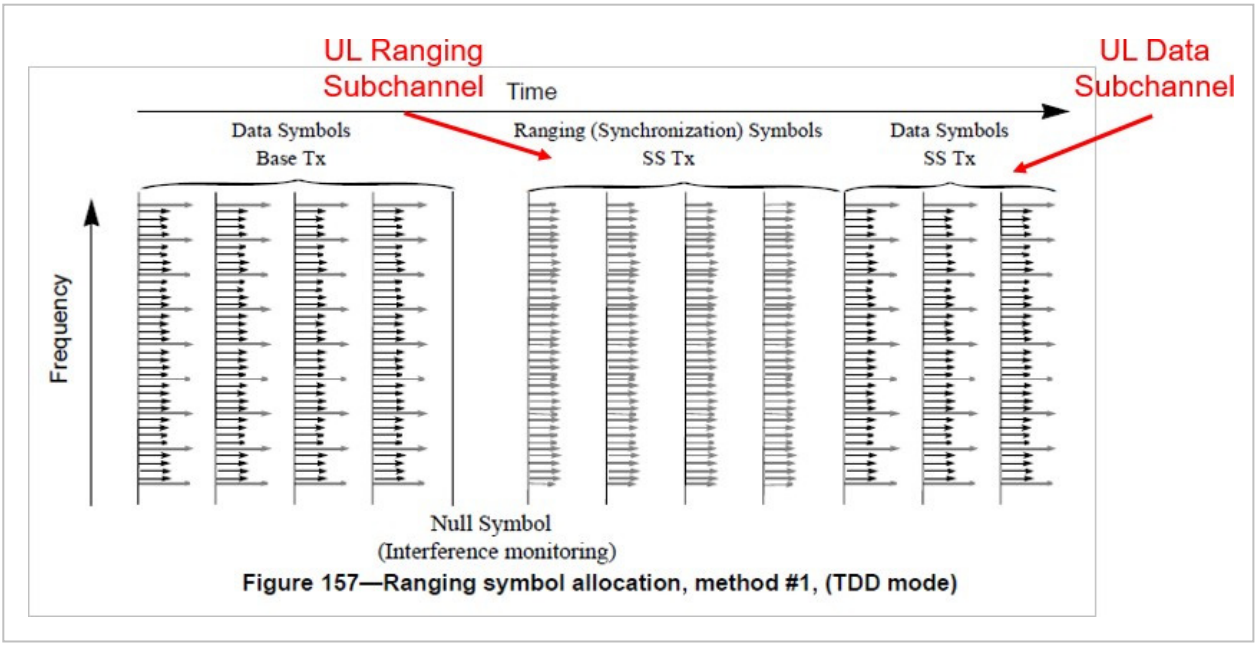
2. Limitation 1.1

The Koo-802.16ab combination renders obvious Limitation 1.1. EX1003, ¶¶157-161. Koo discloses UE and "transmitting data using the OFDMA scheme" in which "OFDMA symbols are separately loaded on sub-carriers and transmitted over prescribed sub-channels." EX1011, ¶5. Koo discloses a "mobile communication system," EX1011, ¶3, in the context of the IEEE 802.16 standard, EX1011, ¶¶8-10, 33. A POSA would have understood and found obvious that Koo's UE includes "*an apparatus*" configured to transmit data signals to a Node **B.** EX1003, ¶157. Koo, however, does not expressly disclose that UEs transmit data signals "*over a data subchannel, wherein the data subchannel comprises a plurality of adjacent or non-adjacent subcarriers within the communication channel*."

802.16ab teaches or suggests this feature. EX1003, ¶158. 802.16ab discloses "upstream access schemes," including a first scheme in which "[e]ach OFDMA (OFDM)symbol will carry either data or ranging slots," and a second

access scheme in which "[e]ach OFDMA (OFDM)symbol will carry both data and ranging slots." EX1012, 0086-87, FIGS. 157-159.

The first access scheme, shown in Figure 157 below, creates data subchannel(s) in the uplink (UL) using time division. EX1003, ¶159. As shown, a data subchannel "*comprises a plurality of adjacent or non-adjacent subcarriers within the communication channel*." *Id*.



EX1012, 0087, FIG. 157 (annotated).

Figures 158-159 of 802.16ab show the second access scheme. EX1012, 0087-88. Figure 158 (below) shows a "User allocated subchannel," which includes at least one data subchannel. EX1012, 0206-07; EX1003, ¶160. As shown, a data subchannel "*comprises a plurality of adjacent or non-adjacent subcarriers within the communication channel*." EX1003, ¶160.

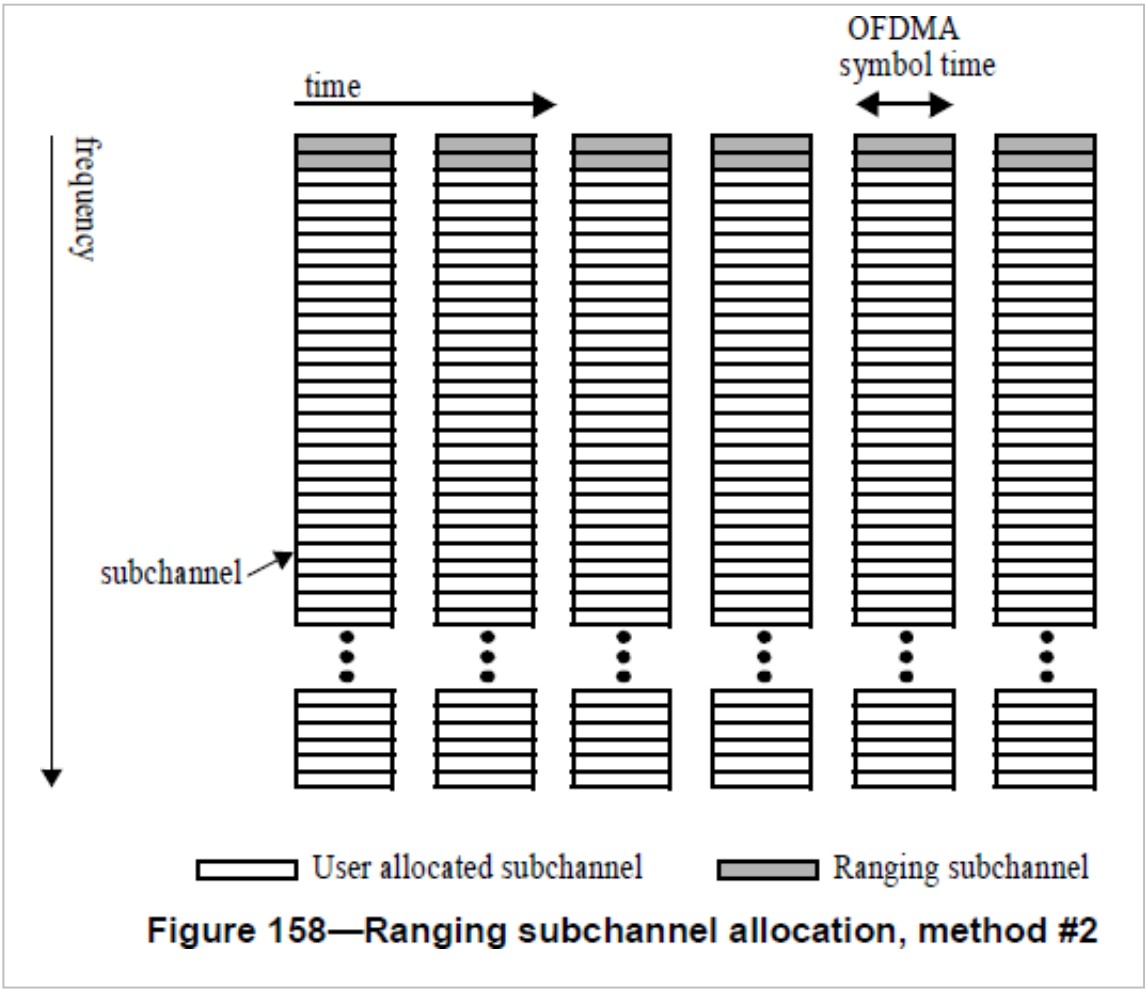


Figure 158—Ranging subchannel allocation, method #2

EX1012, 0087, FIG. 158.

Figure 159 of 802.16ab illustrates another example of the second access method, showing non-adjacent sub-carriers. EX1012, 0088; EX1003, ¶161.

3. Limitation 1.2

Koo teaches or suggests Limitation 1.2. EX1003, ¶¶162-164. Koo discloses that UE selects an RC based on its ranging objective and attempts to execute uplink access to a Node B using the selected RC. EX1011, ¶¶37, 44-49, FIG. 3. For example, "UEs attempting to execute an initial access" would select and use an

RC "assigned with an initial ranging process" to generate and transmit a ranging signal to the Node B in the cell. EX1011, ¶37, FIG. 3 (steps 324, 326, 334). A POSA would have understood Koo's "initial ranging process" is "*for random access*." EX1003, ¶162; EX1011, ¶37 (describing contention-based random access); *see also* EX1001, 1:24-28 (admitting random access includes ranging).

Koo discloses that "[t]he ranging procedure needs ranging sub-channels and RCs …." EX1011, ¶¶7-9. A POSA would have understood that Koo's UE transmits ranging signals "*over a ranging subchannel*." EX1003, ¶163.

Accordingly, a POSA would have understood and found obvious that Koo's UE includes "*an apparatus configured to transmit a ranging signal*" (as explained in Limitation 1.3 below, the modulated signal formed using the selected RC) "*to the serving base station in the cell*" (the Node B) "*over a ranging subchannel for random access*" (over a ranging subchannel during initial access). EX1003, ¶163.

Alternatively, the Koo-802.16ab combination renders obvious Limitation 1.2. EX1003, ¶164. 802.16ab discloses OFDMA-based ranging. EX1012, 0086-90, 0204-06. 802.16ab discloses that when an SS "wants to synchronize to the system channel for the first time," it sends "for a consecutive period of two OFDMA signals a preamble" that is "defined by modulating one Ranging Code[] up on the ranging Sub-Channel carriers." EX1012, 0205; *see also* EX1012, 0088-90. 802.16ab discloses that the logical "Uplink Contention Channel" is "used for SS

initiated ***random access***, including ***ranging*** and bandwidth request." EX1012, 0101. A POSA would have combined Koo with 802.16ab. Section IX.E.1.

4. Limitation 1.3

The Koo-802.16ab combination renders obvious Limitation 1.3. EX1003, ¶¶165-168. Koo discloses that a Node B "generates a plurality of RCs" and "assigns N number of RCs to the initial ranging process." EX1011, ¶40, FIG. 2 (steps 212 and 214). For example, Koo discloses that "10 RCs are assigned with an initial ranging process over UL_MAP message." EX1011, ¶37. Each RC of the "N" RCs is "*a ranging sequence [in] a set of ranging sequences*" (e.g., a set of 10 RCs). EX1003, ¶165. Koo's ranging sequences are "*associated with the cell*" because they are generated by the Node B. EX1011, ¶40; EX1003, ¶165.

Koo discloses that, upon receipt of the UL_MAP message, a UE selects an RC based on its ranging objective from the set of RCs in the UL_MAP message, and attempts to "execute[] uplink access" to the Node B using the selected RC. EX1011, ¶¶37, 44-49; FIG. 3. For example, "UEs attempting to execute an initial access" select one of the "N" (e.g., "10") RCs that the Node B assigned to use for initial ranging. *See* EX1011, ¶¶37, 40. Koo's UE modulates the selected RC "using the OFDMA scheme" to transmit a ranging signal as "OFDMA symbols [that] are separately loaded on sub-carriers and transmitted over prescribed [ranging] sub-channels" to the Node B. EX1011, ¶5; EX1003, ¶166. That is, Koo's UE transmits

a "*ranging signal [] formed from a ranging sequence selected from a set of ranging sequences associated with the cell*." EX1003, ¶166.

802.16ab similarly discloses that a SS "chooses randomly a Ranging Code (from the Initial Ranging domain) and sends it to the BS (as a CDMA code)." EX1012, 0088. Further, the SS "[s]end[s] for a consecutive period of two OFDMA signals a preamble shall perform the long ranging transmission," where "[t]he preamble structure is defined by modulating one Ranging Code, up on the Ranging Sub-Channel." EX1012, 0205. EX1003, ¶167.

802.16ab also discloses that in each of the first and second access schemes, the BS transmits a ranging response to the SS that includes the "original Ranging Code and Ranging Slot" that the SS originally transmitted to the BS. EX1012, 0088-90, FIGS. 160-161; *see id*. ("The BS upon successfully receiving a Ranging Code sends a Ranging Response message that addressed the sending SS by supplying the Ranging Code and Ranging Slot in the message."). 802.16ab explains that in the BS's ranging response, "the combination of Ranging Symbol, []Ranging sub-channel and Ranging Code shall be used to address the sending SS." EX1012, 0021-22. A POSA thus would have understood and found obvious that the randomly selected ranging code "*identif[ies] the mobile station*." EX1003, ¶168. That is, BS includes the original ranging code in the ranging response to direct the ranging response to the SS that sent the particular ranging code. *Id*.

5. Limitation 1.4

The Koo-802.16ab-Chayat combination renders obvious Limitation 1.4. EX1003, ¶¶169-172. The Koo-802.16ab combination renders obvious "*the ranging signal*" recited in Limitations 1.2-1.3. Sections IX.F.3-IX.F.4. 802.16ab further teaches that "*the ranging signal lasts over a period of one or multiple [OFDM] symbols*." EX1003, ¶169. 802.16ab discloses that the "Long Ranging transmission shall be performed during the two first consecutive symbols of the UL frame. The same ranging code is transmitted during each symbol." EX1012, 0205.

802.16ab discloses that "a ***preamble*** shall perform the long ranging transmission," EX1012, 0205, and that "OFDM can incorporate ***peak-to-average reduction signal processing*** to partially (but not completely) alleviate its high sensitivity to power amplifier nonlinearities," EX1012, 0128. But 802.16ab does not expressly disclose that "*the ranging signal exhibits a low peak-to-average power ratio in the time domain*." EX1003, ¶170.

Chayat teaches or suggests OFDM signals that "*exhibit[] a low peak-to-average power ratio in the time domain*." EX1003, ¶171. Chayat discloses "sets of preambles satisfying good PAPR properties in OFDMA systems." EX1013, 4:12-13. Chayat's "preambles satisfy a ***low Peak-to-Average Power Ratio (PAPR)*** property for numerous subsets of the useable subcarrier set." EX1013, 4:14-15. Chayat discloses that "[b]y using as a preamble, a carefully crafted set of

subcarrier modulation values, the PAPR of the preamble can be kept at about 3 dB, significantly less than the values typical to data." EX1013, 2:11-13. A POSA would have understood that the PAPR discussed in 802.16ab and Chayat is "*in the time domain*." EX1003, ¶171. A POSA would have been motivated to combine Chayat's low-PAPR preamble sequences with the combined Koo-802.16ab system. EX1003, ¶172; Section IX.E.2.

6. Limitation 1.5

The Koo-802.16ab-Suzuki combination renders obvious Limitation 1.5. EX1003, ¶¶173-177. 802.16ab teaches or suggests that "*the ranging subchannel comprises at least one block of subcarriers within the communication channel*." EX1003, ¶173. 802.16ab discloses that "subcarriers" are "grouped into sub-channels." EX1012, 0077; *see also* EX1012, 0198-201. 802.16ab further describes and shows ranging subchannels as including "ranging slots." EX1012, 0086. A POSA thus would have understood and found obvious that the ranging subchannel(s) disclosed by 802.16ab, *see e.g.,* EX1012, 0086-90, include "*at least one block of subcarriers within the communication channel*." EX1003, ¶173.

802.16ab discloses "[n]ull carriers" that have "no transmission at all, for guard bands and DC carrier," and explains that "guard bands … enable the signal to naturally decay and create the FFT 'brick wall' shaping." EX1012, 0175. But

802.16ab does not expressly disclose that the "*power levels of subcarriers at both ends of a block are set to zero*." EX1003, ¶174.

Suzuki teaches or suggest this feature. EX1003, ¶175. Suzuki discloses "one transmission band" or "band slot" as having "twenty-four subcarriers," such as subcarriers numbered 0 to 23 in Figure 1. EX1009, 3:5-16. Suzuki explains that only 22 of the subcarriers are available to carry information because "the subcarrier numbers 0 and 23 at both ends within one band slot, they are made guard bands in which no subcarrier is arranged and their powers are made zero." EX1009, 3:16-20. A POSA would have been motivated to combine Suzuki's zero-power guard bands (zero-power subcarriers) at both ends of a block of subcarriers in 802.16ab's ranging subchannel in order to reduce interference between adjacent blocks of subcarriers, as discussed in Section IX.E.3. EX1003, ¶177.

G. Independent Claims 9, 17, and 22

Independent claim 17 is a method corresponding to and reciting nearly identical limitations as the mobile station recited in claim 1. EX1003, ¶¶178-179. Claim 17 is thus obvious over the Koo-802.16ab-Chayat-Suzuki combination for the same reasons as claim 1. EX1003, ¶179.

Independent claims 9 and 22 are directed to a base station and a method, respectively, for receiving (from a mobile station) data and ranging signals that are similar to those recited in independent claim 1. EX1003, ¶180. That is, claims 9

and 22 are directed to a base station and method corresponding to the mobile station and method recited in claims 1 and 17, respectively. EX1003, ¶180. The base station and method of claims 9 and 17, however, require receiving the "*data signal from a first mobile station*" while receipt of the "*ranging signal [is] from a second mobile station*." EX1001, 7:60-67, 9:17-22 (Limitations 9.1/22.1 and 9.2/22.2).

Each of Koo, 802.16ab, and Suzuki disclose a base station (or Node B) for receiving the data and ranging signals transmitted by a plurality of mobile stations (UEs, SSs, or portable stations) that are served by the base station. *See, e.g.,* EX1011, ¶¶38-44, FIG. 2; EX1012, 0088-90, FIGS. 160-161; EX1009, 2:57-61. A POSA would have understood and found obvious that these base stations would receive a data signal from a first mobile (e.g., via a data sub-channel), and receive a ranging signal from a second, different mobile that was also being serviced by the base station (e.g., via a ranging sub-channel). EX1003, ¶181. The Koo-802.16ab-Chayat-Suzuki combination thus renders obvious Limitations 9.1/22.1 and 9.2/22.2, as well as the preambles and other limitations of claims 9 and 22 that are nearly identical to claims 1 and 17 for at least the reasons discussed above. EX1003, ¶181; Section IX.F.

H. Claims 4, 20

802.16ab teaches or suggests that "*subcarriers in a block are contiguous in frequency*." EX1003, ¶182. 802.16ab discloses that "[t]he carriers forming one subchannel may, but need not be adjacent." EX1012, 0175, FIGS. 157-158.

Suzuki also teaches or suggests this limitation. EX1003, ¶¶183-184. Suzuki discloses a "band slot" having "twenty-four subcarriers" that are "successively arranged at an equal interval." EX1009, 3:13-16, FIGS. 3A-3B.

I. Claims 6-7, 18-19

The Koo-802.16ab-Chayat-Suzuki combination renders obvious claims 6 and 18. EX1003, ¶185. Suzuki discloses that the power levels of "the subcarrier[s] … at both ends within one band slot[] … are made zero," EX1009, 3:13-16, and the subcarriers at both ends are "*towards the high-end and low-end frequency boundaries of a block*," EX1009, FIGS. 3A-3B. Suzuki discloses that subcarriers "*towards the center of the block*" (e.g., subcarriers 1-22) carry information. EX1009, 3:16-17. Accordingly, a POSA would have understood that in the combined system the zero-power subcarriers (at high- and low-end frequency boundaries) have "*lower*" power than information-carrying subcarriers "*towards the center of the block*." EX1003, ¶185.

Similarly, the Koo-802.16ab-Chayat-Suzuki combination renders obvious claims 7 and 19. EX1003, ¶186. A POSA would have understood that Suzuki's

zero-power "*boundary subcarriers of a block … are attenuated*" as compared to information-carrying subcarriers. *Id*. Accordingly, in the combined system Suzuki's "*attenuated*" or zero-power boundary subcarriers applied to a ranging sub-channel would "*reduce interference with other uplink signals when signal time misalignment occurs at the base station*." EX1003, ¶¶53, 186.

J. Claim 8

Chayat teaches or suggests "*wherein the ranging sequence is a binary or non-binary sequence*." EX1003, ¶187. Chayat discloses "utilize[ing] and further generaliz[ing] the abovementioned works towards the construction of hierarchical sets of OFDMA preambles," where the works included Golay's "binary sequences" as well as non-binary sequences. EX1013, 6:6-14.

K. Claim 12

802.16ab renders obvious claim 12's limitations. EX1003, ¶188. 802.16ab discloses that the BS performs "user code detection." EX1012, 0204. 802.16ab also discloses that the BS transmits, in the ranging response message, the original ranging code sent by the SS. EX1012, 0021-22, 0089-90, FIGS. 160-161.

L. Claims 15-16, 23-24

802.16ab teaches or suggests that the BS is configured to detect "*a time delay*" (claims 15, 23) and "*a power level*" (claims 16, 24) "*of the received ranging signal*" and to inform the SS that sent the ranging signal to adjust "*transmission*

time based on the detected time delay" (claims 15, 23) and "*transmission power based on the detected power level*" (claims 16, 24). EX1003, ¶¶189-192.

802.16ab discloses that the BS's "Ranging Response message contains all the needed adjustment (e.g.[,] ***time***,[]***power*** and possibly frequency corrections)[]and a status notification." EX1012, 0088; *see also* EX1012, 0089-90, FIGS. 160-161. Upon receiving the ranging response message, the SS adjusts time and power parameters. EX1012, 0088-90, FIGS. 160-161. A POSA would have understood and found obvious that the BS would detect the time delay and power level of the ranging signal in order to determine and send the needed time and power adjustments. EX1003, ¶¶190, 192.

X. GROUND 4: OBVIOUSNESS OVER KOO, 802.16AB, CHAYAT, SUZUKI, & GIBSON

Claims 2-3, 5, 10-11, 13-14, and 21 would have been obvious over the Koo-802.16ab-Chayat-Suzuki-Gibson combination. EX1003, ¶¶193-197.

A. Claims 2-3, 10-11

Based on Gibson's teachings regarding configuring adjacent cells to operate differently to avoid interference, *see* Section VIII.B, it would have been obvious that the "*subcarrier configuration of the ranging subchannel*" for different cells (claims 2, 10) and to use different "*set[s] of ranging sequences*" in different cells (claims 3, 11), particularly for adjacent cells in the combined Koo-802.16ab-

Chayat-Suzuki system. EX1003, ¶194. A POSA would have been motivated to do so in order to minimize or avoid co-channel interference between adjacent cells. *Id*. A POSA would have reasonably expected success in making the combination because, as Gibson teaches, it was routine and conventional to configure adjacent cells to operate differently (e.g., use different frequency configurations) in order to avoid inter-cell interference. *Id*.

B. Claims 5, 21

Gibson discloses the conventional open-loop power control method recited in claims 5 and 21, explaining the benefits of power control in general and open-loop power control in particular, specifically for TDD-based systems such as 802.16ab's first upstream access scheme. Section VIII.C; EX1010, 0459-64; EX1012, 0086. A POSA would have been motivated and had a reasonable expectation of success in using Gibson's open-loop power control in the combined Koo-802.16ab-Chayat-Suzuki system for the same reasons discussed in Section VIII.C (e.g., fast and accurate in TDD-based systems, and predictable use of conventional technique). EX1003, ¶195; *see also* EX1012, 0225 (increasing output power per retry).

C. Claims 13-14

The Koo-802.16ab-Chayat-Suzuki-Gibson combination renders obvious claims 13 and 14. EX1003, ¶¶196-197. 802.16ab discloses detecting "*the ranging*

sequence," as recited in claim 12, but does not expressly disclose the "*matched filtering*" and "*correlat[ing]*" required in claims 13 and 14, respectively.

Gibson demonstrates that a "matched filter receiver" and a "correlation receiver" were well-known and obvious elements in mobile communication systems, such as base stations detecting a user's code. EX1010, 0154, 0193 ("most CDMA detectors are correlation receivers"). It would have been obvious to a POSA to include a matched-filter receiver or a correlation receiver, as taught by Gibson, in the BS of the Koo-802.16ab-Chayat-Suzuki system, which would have predictably enabled the BS to detect ranging codes. EX1003, ¶197.

XI. DISCRETIONARY CONSIDERATIONS UNDER SECTIONS 314(a) AND 325(d) STRONGLY FAVOR INSTITUTION.

A. *Fintiv* strongly favors institution.

Should Patent Owner seek denial under Fintiv, Honda will seek permission to reply to address the facts and law as they stand at that time. Under the current facts, *Fintiv* is not applicable. There is no trial scheduled in this district court. In fact, there is not even a scheduled date for remand from the MDL court to Honda's trial court (in the Southern District of Ohio) that will, upon that remand, schedule a trial date. And the median time to trial for civil actions in the Eastern District of Michigan (where the nine parties' cases have been consolidated for pretrial proceedings) is nearly four years. *See* EX1034 at 40. For the Southern District of Ohio, there is only one data point for a bench trial (104.8 months) and one for a jury trial (35.1 months). Both

dates would occur well after any Final Written Decision. *See* EX1033.

B. *General Plastic* and *Valve Corp.* strongly favor institution.

Serial petitioning concerns addressed in *General Plastic Industrial Co., Ltd. v. Canon Kabushiki Kaisha*, IPR2016-01357, Paper 19 (P.T.A.B. Sept. 6, 2017) (§ II.B.4.i precedential), and *Valve Corp. v. Electronic Scripting Products, Inc.*, IPR2019-00062, Paper 11 (P.T.A.B. April 2, 2019) (precedential), are not at play here. Petitioner has not previously petitioned for IPR of the ’366 patent. Non-parties Dell Inc. and Dell Technologies Inc. (“Dell”) previously sought IPR of the ’366 patent in IPR2021-01480 based on different prior art and arguments, and a different technical expert. *See* EX1020, 7.

Petitioner has not sought Petition for *Inter Partes* Review of the ‘366 and has not coordinated with and has no relationship with Dell, who is not a co-defendant in the MDL centralized in the Eastern District of Michigan. *See* EX1024. Nor has Petitioner used the Dell IPR as a “roadmap” to craft invalidity positions. Rather, Petitioner’s review and consideration of the record in IPR2021-01480 is no different than review of the ’366 patent’s file history—routine diligence to understand the patent’s history before the Office. Moreover, the deficiencies in Dell’s prior-art combinations that led the Board to deny Dell’s petition are not present here. Finally, the concerns for fundamental fairness undergirding *General Plastic* and *Valve Corp.* confirm that institution is warranted here. Patent Owner sued Dell in January 2021, more than a year before filing suit against Petitioner. That the Petition here comes after the Dell IPR is

the result of Patent Owner's own actions, not any nefarious serial-petitioning strategy to harass Patent Owner.

C. *Advanced Bionics* strongly favors institution.

Applying the two-part framework from *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8-9 (P.T.A.B. February 13, 2020) (precedential), demonstrates that denial under § 325(d) is not appropriate. Under part one, the same or substantially the same art or arguments were not previously presented to the Office, ending the inquiry in favor of institution. The "new, noncumulative prior art asserted in the Petition" Petition for *Inter Partes* Review of USP 8,467,366 strongly favors IPR. *Oticon Medical AB v. Cochlear Ltd.*, IPR2019-00975, Paper 15 at 20 (P.T.A.B. October 16, 2019) (§§ II.B and II.C precedential).

XII. CONCLUSION

The Board should grant IPR and cancel claims 1-24.

Respectfully submitted,

Dated 3/30/2023

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CLAIM LISTING

Element	Claim Language
1.P	In a multi-cell orthogonal frequency division multiple access (OFDMA) wireless communication system comprising a plurality of base stations and mobile stations, a mobile station configured to communicate with a serving base station in a cell via a communication channel, the mobile station comprising:
1.1	an apparatus configured to transmit a data signal to the serving base station in the cell over a data subchannel, wherein the data subchannel comprises a plurality of adjacent or non-adjacent subcarriers within the communication channel; and
1.2	an apparatus configured to transmit a ranging signal to the serving base station in the cell over a ranging subchannel for random access, wherein:
1.3	the ranging signal is formed from a ranging sequence selected from a set of ranging sequences associated with the cell for identifying the mobile station;
1.4	the ranging signal lasts over a period of one or multiple orthogonal frequency division multiplexing (OFDM) symbols and the ranging signal exhibits a low peak-to-average power ratio in the time domain; and
1.5	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.

Element	Claim Language
2	The mobile station of claim 1, wherein the subcarrier configuration of the ranging subchannel for the cell is different from subcarrier configurations of ranging subchannels for other cells.
3	The mobile station of claim 1, wherein the set of ranging sequences for the cell is different from sets of ranging sequences for other cells.
4	The mobile station of claim 1, wherein subcarriers in a block are contiguous in frequency.
5.P	The mobile station of claim 1, further comprising an apparatus configured to control a transmission power of the ranging signal using an open-loop power control method by:
5.1	estimating a path loss between the serving base station and the mobile station based on a received downlink signal;
5.2	setting the transmission power of the ranging signal based on the path loss; and
5.3	increasing the transmission power of the ranging signal for retransmission.
6	The mobile station of claim 1, wherein a power level of subcarriers towards the high-end and low-end frequency boundaries of a block of subcarriers is lower than a power level of subcarriers towards the center of the block.

Element	Claim Language
7	The mobile station of claim 1, wherein boundary subcarriers of a block of subcarriers in the ranging subchannel are attenuated to reduce interference with other uplink signals when signal time misalignment occurs at the base station.
8	The mobile station of claim 1, wherein the ranging sequence is a binary or non-binary sequence.
9.P	In a multi-cell orthogonal frequency division multiple access (OFDMA) wireless communication system, a base station configured to communicate with mobile stations in a cell via a communication channel, the base station comprising:
9.1	an apparatus configured to receive a data signal from a first mobile station in the cell over a data subchannel, wherein the data subchannel comprises a plurality of adjacent or non-adjacent subcarriers within the communication channel; and
9.2	an apparatus configured to receive a ranging signal from a second mobile station in the cell over a ranging subchannel for random access, wherein:
9.3	the ranging signal is formed from a ranging sequence selected from a set of ranging sequences associated with the cell for identifying a mobile station;

Element	Claim Language
9.4	the ranging signal lasts over a period of one or multiple orthogonal frequency division multiplexing (OFDM) symbols and the ranging signal exhibits a low peak-to-average power ratio in the time domain; and
9.5	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.
10	The base station of claim 9, wherein the subcarrier configuration of the ranging subchannel for the cell is different from subcarrier configurations of ranging subchannels for other cells.
11	The base station of claim 9, wherein the set of ranging sequences for the cell is different from sets of ranging sequences for other cells.
12	The base station of claim 9, further comprising an apparatus configured to detect the ranging sequence in the received ranging signal in the time domain, frequency domain, or both time and frequency domain.
13	The base station of claim 12, wherein the apparatus applies matched filtering to the received ranging signal to detect the ranging sequence.

Element	Claim Language
14	The base station of claim 12, wherein the apparatus correlates the received ranging signal with a ranging sequence stored at the base station to detect the ranging sequence.
15	The base station of claim 9, further comprising an apparatus configured to detect a time delay of the received ranging signal and to inform the second mobile station to adjust transmission time based on the detected time delay.
16	The base station of claim 9, further comprising an apparatus configured to detect a power level of the received ranging signal and to inform the second mobile station to adjust a transmission power based on the detected power level.
17.P	In an orthogonal frequency division multiple access (OFDMA) wireless communication system, a method for signal transmission by a mobile station to a serving base station via a communication channel, the method comprising:
17.1	transmitting a data signal over a data subchannel to the serving base station, wherein the data subchannel comprises a plurality of adjacent or non-adjacent subcarriers within the communication channel; and
17.2	transmitting a ranging signal over a ranging subchannel to the serving base station for random access, wherein:
17.3	the ranging signal is formed from a ranging sequence selected from a set of ranging sequences for identifying the mobile station;

Element	Claim Language
17.4	the ranging signal lasts over a period of one or multiple orthogonal frequency division multiplexing (OFDM) symbols and the ranging signal exhibits a low peak-to-average power ratio in the time domain; and
17.5	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.
18	The method of claim 17, wherein a power level of subcarriers towards the high-end and low-end frequency boundaries of a block of subcarriers is lower than a power level of subcarriers towards the center of the block.
19	The method of claim 17, wherein boundary subcarriers of a block of subcarriers in the ranging subchannel are attenuated to reduce interference with other uplink signals when signal time misalignment occurs at the base station.
20	The method of claim 17, wherein subcarriers in a block are contiguous in frequency.
21.P	The method of claim 17, further comprising controlling a transmission power of the ranging signal using an open-loop power control method by:

Element	Claim Language
21.1	estimating a path loss between the serving base station and the mobile station based on a received downlink signal;
21.2	setting the transmission power of the ranging signal based on the path loss; and
21.3	increasing the transmission power of the ranging signal for retransmission.
22.P	In an orthogonal frequency division multiple access (OFDMA) wireless communication system, a method for receiving signals by a base station from a plurality of mobile stations via a communication channel, the method comprising:
22.1	receiving a data signal over a data subchannel from a first mobile station, wherein the data subchannel comprises a plurality of adjacent or non-adjacent subcarriers within the communication channel; and
22.2	receiving a ranging signal over a ranging subchannel for random access by a second mobile station, wherein:
22.3	the ranging signal is formed from a ranging sequence selected from a set of ranging sequences for identifying the mobile station;
22.4	the ranging signal lasts over a period of one or multiple orthogonal frequency division multiplexing (OFDM) symbols and the ranging signal exhibits a low peak-to-average power ratio in the time domain; and
22.5	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.

Element	Claim Language
23	The method of claim 22, further comprising detecting a time delay of the received ranging signal and informing the second mobile station to adjust transmission time based on the detected time delay.
24	The method of claim 22, further comprising detecting a power level of the received ranging signal and informing the second mobile station to adjust a transmission power based on the detected power level.

CERTIFICATION UNDER 37 CFR § 42.24

Under the provisions of 37 CFR § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13,926 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

Dated 3/30/2023

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CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.6(e)(4)(i) *et seq.* and 42.105(b), the undersigned certifies that on March 30, 2023, a complete and entire copy of this Petition for *Inter Partes* Review and all supporting exhibits were provided by Federal Express, to the Patent Owner, by serving the correspondence address of record as follows:

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