IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of:	Xiaodong Li, et al.	
U.S. Patent No.:	10,771,302	Attorney Docket No.: 15625-0037IP4
Issue Date:	September 8, 2020	
Appl. Serial No.:	15/953,950	
Filing Date:	April 16, 2018	
Title:	CHANNEL PROBING SIGNAL FOR A BROADBAND COMMUNICATION SYSTEM	

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PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT NO. 10,771,302 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42

TABLE OF CONTENTS

I. REQUIREMENTS FOR IPR 1
A. Grounds for Standing 1
B. Challenge and Relief Requested 1
C. Claim Construction 8
D. Level of Ordinary Skill in the Art 8

II. THE '302 PATENT 9
A. Brief Description 9
B. Prosecution History 10

III. THE CHALLENGED CLAIMS ARE UNPATENTABLE 10
A. GROUND 1 – 802.16a and Koo Render Obvious Claims 23, 24, 26, and 27 11
1. 802.16a Overview 11
2. Koo Overview 17
3. The Combination of 802.16a-2003 and 802.16-2001 (collectively "802.16a") 21
4. The Combination of 802.16a and Koo 22
5. Claim 23 is obvious over 802.16a in view of Koo 25
6. Claims 24, 26, and 27 are obvious over 802.16a in view of Koo 49
B. GROUND 2 – 802.16a and Kitroser Render Obvious Claims 23, 24, 26, and 27 58
1. Kitroser Overview 58
2. The Combination of 802.16a and Kitroser 59
3. Claim 23 is obvious over 802.16a in view of Kitroser 61
4. Claims 24, 26, and 27 are obvious over 802.16a in view of Kitroser 64

IV. PTAB DISCRETION SHOULD NOT PRECLUDE INSTITUTION 66
A. *Fintiv* strongly favors institution. 66
B. *General Plastic* and *Valve Corp.* strongly favor institution. 67
C. Advanced Bionics strongly favors institution. 67

V. CONCLUSION AND FEES 68

VI. MANDATORY NOTICES UNDER 37 C.F.R § 42.8(a)(1) 68
A. Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1) 68
B. Related Matters Under 37 C.F.R. § 42.8(b)(2) 68
C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3) 70
D. Service Information 70

EXHIBITS

HONDA-1001	U.S. Patent No. 10,771,302 to Li, et al. ("the '302 Patent")
HONDA-1002	Excerpts from the Prosecution History of the '302 Patent ("the Prosecution History")
HONDA-1003	Declaration and Curriculum Vitae of Dr. R. Michael Buehrer
HONDA-1004	IEEE Std. 802.16a-2003, entitled "IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed Broadband Wireless Access Systems Amendment 2: Medium Access Control Modifications and Additional Physical Layer Specifications for 2-11 GHz" ("802.16a-2003")
HONDA-1005	IEEE Std. 802.16-2001, entitled "IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed Broadband Wireless Access Systems" ("802.16-2001")
HONDA-1006	U.S. Patent Application Publication 2004/0174845 to Koo et al. ("Koo")
HONDA-1007	Itzik Kitroser, Yossi Segal, Yigal Leiba, Zion Hadad, "IEEE 802.16e Mobility System Perspective," IEEE 802.16 Broadband Wireless Access Working Group, document IEEE C802.16e-03_06 ("Kitroser")
HONDA-1008	Yigal Leiba, Dr. Zion Hadad, Itzik Kitroser, Yossi Segal, Moshe Levinson, "802.16a OFDMA PHY suitability for mobile applications," IEEE 802.16 Broadband Wireless Access Working Group, document IEEE C802.16sgm-02_23 ("Leiba")
HONDA-1009	U.S. Patent Application Publication 2002/0126650A1 to Hall et al. ("Hall")
HONDA-1010	U.S. Provisional Application No. 60/540,032

HONDA-1011	U.S. Provisional Application No. 60/540,586
HONDA-1012	Declaration and Curriculum Vitae of June Munford.
HONDA-1013	John Terry and Juha Heiskala, "OFDM Wireless LANs: A Theoretical and Practical Guide," Sams Publishing, 2002 ("Terry")
HONDA-1014	*Neo Wireless LLC v. American Honda Motor Co., Inc. et al.*, 2:22-cv-01824, SD OH, March 29, 2022
HONDA-1015	*Intentionally Left Blank*
HONDA-1016	Ohio Southern District Time to Milestones
HONDA-1017	United States District Courts – National Judicial Caseload Profile, June 2022

American Honda Motor Co., Inc. ("Petitioner" or "Honda") petitions for *Inter Partes* Review ("IPR") of claims 23, 24, 26, and 27 ("the Challenged Claims") of U.S. Patent No. 10,771,302 ("the '302 Patent").

I. REQUIREMENTS FOR IPR

A. Grounds for Standing

Petitioner certifies that the '302 Patent is available for IPR. Petitioner is not barred or estopped from requesting review. Petitioner was first served with a complaint of infringement of the '302 Patent not more than one year prior to the filing of this petition ("Petition") with Honda having been served on March 30, 2022. HONDA-1014.

B. Challenge and Relief Requested

Petitioner requests an IPR of the Challenged Claims on the grounds set forth in the table shown below, and requests that each of the Challenged Claims be found unpatentable. An explanation of unpatentability is provided in the detailed description that follows, which indicates where each element can be found in the cited prior art, and the relevance of that prior art. Additional explanation and support for each ground is set forth in the Declaration of Dr. R. Michael Buehrer (the "Buehrer Declaration"), referenced throughout this Petition. HONDA-1003.

Ground	'302 Patent Claims	Basis for Rejection
1	23, 24, 26, and 27	§103: 802.16a-2003 and 802.16-2001 (collectively "802.16a") in view of Koo
2	23, 24, 26, and 27	§103: 802.16a in view of Kitroser

The '302 Patent issued from U.S. Application No. 15/953,950, filed April 16, 2018, and claims priority through a chain of continuation applications to international application no. PCT/US2005/003518, filed on January 27, 2005 (hereinafter the "'302 PCT Filing Date"), which claims priority to two provisional applications, U.S. provisional application no. 60/540,586, filed on January 30, 2004 (the "'302 Second Provisional"), and U.S. provisional application no. 60/540,032, filed on January 29, 2004 (the "'302 First Provisional").

The Challenged Claims of the '302 Patent are not entitled to the earlier priority dates of the '302 First Provisional and the '302 Second Provisional because these provisional applications do not provide support for, at least, independent claim 23 and the dependent claims thereto (including without limitation the claims 24, 26 and 27). Claim 23 recites "*the probing signal with a code sequence* ***modulated*** *in the* ***frequency domain***." HONDA-1001, claim 23. The '302 Patent specification does not use the term "probing signal" but instead describes a "Direct Sequence Spread Spectrum (DSSS) signal" that can be used for "channel probing." HONDA-1001, 2:40-41, 46-47. To the extent the '302 Patent specification provides support for the claim feature recited above, it discloses that "the DSSS signal is **modulated** in either the time

domain **or the frequency domain**." HONDA-1001, 4:46-48. However, this disclosure does not appear in either the '302 First Provisional or the '302 Second Provisional.

The '302 First Provisional discloses details of multi-carrier communication systems and pilot subcarriers. HONDA-1010, Title, p. 1 (§ 2). However, the '302 First Provisional does not mention "probing signal" or "code sequence" or "DSSS" at all, much less a probing signal or code sequence or DSSS modulated **in the frequency domain**.

The '302 Second Provisional discloses systems implementing Multi-Carrier (MC) and DSSS (also referred to as "SS") and in particular "a scheme that coordinates MC and SS signaling in one system." HONDA-1011, p. 1 (§ 2). However, the '302 Second Provisional merely discloses that "the MC signal is modulated on subcarriers in the frequency domain while the **SS signal is modulated in the time domain**." HONDA-1011, pp. 2, 5. Thus, the '302 Second Provisional lacks the phrase "or the frequency domain" which appears in the '302 Patent specification. A comparison of corresponding portions of the '302 Patent specification and the '302 Second Provisional is included below, highlighting the phrase "***or the frequency domain***" in the '302 Patent specification which is missing in the provisional:

'302 Patent	**'302 Second Provisional**
FIG. 6 is an illustration of MC signals overlaid with DSSS signals in	In frequency domain, the overlay of the MC spectrum and SS spectrum is

the frequency domain where the power level of the DSSS signal is much lower than that of the MC signal. The subcarriers in a subchannel are not necessarily adjacent to each other in the frequency domain. FIG. 7 is similar to FIG. 6 wherein not all MC subchannels are occupied. It illustrates a scenario where some MC subchannels are not energized. In another embodiment, the MC signal is modulated on subcarriers in the frequency domain ***while the DSSS signal is modulated in either the time domain <u>or the frequency domain</u>***. In one embodiment the modulation symbol on the DSSS sequence is one and the sequence is unmodulated	depicted in Figure 6. Figure 7 illustrates the scenario that some MC subchannels are not energized. In one embodiment, the MC signal is modulated on subcarriers in the frequency domain ***while the SS signal is modulated in the time domain***. A special case is that the modulation symbol on the SS sequence is 1; that is, the sequence is unmodulated. Correspondingly, the MC signal is demodulated in frequency domain and the SS signal is demodulated in time domain.

Therefore, because the ’302 First Provisional and the ’302 Second Provisional do not provide support for all features of independent claim 23, the Challenged Claims

are not entitled to the earlier priority dates of the '302 First Provisional and the '302 Second Provisional. Accordingly, the earliest possible priority date for the Challenged Claims is **January 27, 2005** (the '302 PCT Filing Date, hereinafter the "Critical Date").

Applied references are prior art based on at least one of the bases listed below, relative to the Critical Date:

Reference	Publication Date	Basis
802.16a-2003	4/1/2003	§102(b)
802.16-2001	4/8/2002	§102(b)
Koo	9/9/2004	§102(a)
Kitroser	1/14/2003	§102(b)

802.16a-2003 (HONDA-1004) qualifies as prior art under 35 U.S.C § 102(b). Specifically, 802.16a-2003 is an IEEE Standard published on April 1, 2003. HONDA-1004, p.3[1] ("Published 1 April 2003"). 802.16a-2003 was made available to the public by the Penn State University library shortly after September 22, 2003 (more than 1 year before the Critical Date) if not earlier by the IEEE, as confirmed by the Declaration of June Munford. HONDA-1012, ¶¶ 15-18. Accordingly, 802.16a-2003 is prior art at least under 35 U.S.C. § 102(b).[2]

[1] This page number refers to the annotated page number of exhibit HONDA-1004.

[2] Petitioner notes that 802.16a-2003 also qualifies as prior art under 35 U.S.C. § 102(a) even with respect to the earlier filing date of the '302 First Provisional.

802.16-2001 (HONDA-1005) qualifies as prior art under 35 U.S.C § 102(b). Specifically, 802.16-2001 is an IEEE Standard published on April 8, 2002. HONDA-1005, p.3[3] ("Published 8 April 2002"). 802.16-2001 was made available to the public by the IEEE as of October 25, 2002 (more than 1 year before the Critical Date) if not earlier, as confirmed by the Declaration of June Munford. HONDA-1012, ¶¶ 7-14. Accordingly, 802.16-2001 is prior art at least under 35 U.S.C. § 102(b).[4]

Koo (HONDA-1006) qualifies as prior art at least under 35 U.S.C § 102(a). Specifically, Koo is a U.S. patent application publication that was published on September 9, 2004, more than 4 months before the Critical Date. Accordingly, Koo is prior art at least under 35 U.S.C. § 102(a).

Kitroser (HONDA-1007) qualifies as prior art under 35 U.S.C § 102(b). Specifically, Kitroser is an IEEE standard contribution document that was submitted to the IEEE 802.16 Broadband Wireless Access Working Group on January 10, 2003. HONDA-1007, p.1[5] ("Date Submitted 2003-01-10"). Kitroser was first available to the public by the Internet Archive as of July 2, 2003 (more than 1 year before the Critical Date) if not earlier by the IEEE, as confirmed by the Declaration of June Munford.

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[3] This page number refers to the annotated page number of exhibit HONDA-1005.

[4] Petitioner notes that 802.16-2001 also qualifies as prior art under 35 U.S.C. § 102(a) even with respect to the earlier filing date of the '302 First Provisional.

[5] This page number refers to the annotated page number of exhibit HONDA-1007.

HONDA-1012, ¶¶ 19-22. Accordingly, Kitroser is prior art at least under 35 U.S.C. § 102(b).[6]

In addition to the references above, the following references are cited herein and in the Buehrer Declaration as corroborating evidence.

Leiba (HONDA-1008) qualifies as prior art under 35 U.S.C § 102(b). Specifically, Leiba is an IEEE standard contribution document that was submitted to the IEEE 802.16 Broadband Wireless Access Working Group on September 19, 2002. HONDA-1008, p.1[7] ("Date Submitted 19.9.2002"). Leiba was first available to the public by the Internet Archive as of April 20, 2003 (more than 1 year before the Critical Date) if not earlier by the IEEE, as confirmed by the Declaration of June Munford. HONDA-1012, ¶¶ 23-26. Accordingly, Leiba is prior art at least under 35 U.S.C. § 102(b).[8]

Hall (HONDA-1009) qualifies as prior art at least under 35 U.S.C § 102(b). Specifically, Hall is a U.S. patent application publication that was published on September 12, 2002, more than 1 year before the Critical Date. Accordingly, Hall is prior

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[6] Petitioner notes that Kitroser also qualifies as prior art under 35 U.S.C. § 102(a) even with respect to the earlier filing date of the '302 First Provisional.

[7] This page number refers to the annotated page number of exhibit HONDA-1008.

[8] Petitioner notes that Leiba also qualifies as prior art under 35 U.S.C. § 102(a) even with respect to the earlier filing date of the '302 First Provisional.

art at least under 35 U.S.C. § 102(b).[9]

Terry (HONDA-1013) qualifies as prior art under 35 U.S.C § 102(b). Specifically, Terry was published as a first printing on December 2001. HONDA-1013, p.3[10] ("First Printing: December 2001"). Terry was available to the public by Penn State University library shortly after August 7, 2004 (more than 5 months before the Critical Date) if not earlier by the publisher of Terry, as confirmed by the Declaration of June Munford. HONDA-1012, ¶¶ 27-30. Accordingly, Terry is prior art at least under 35 U.S.C. § 102(a).

C. Claim Construction

Based on the evidence below, striking similarities between the prior art's description of the claimed elements and that found within the '302 Patent specification, and the well-established principle that "claim terms need only be construed to the extent necessary to resolve the controversy," no formal claim constructions are necessary in this proceeding. *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011). For convenience, Petitioner submits copies of claim construction briefing in the district court litigation.

D. Level of Ordinary Skill in the Art

[9] Petitioner notes that Hall also qualifies as prior art under 35 U.S.C. § 102(b) even with respect to the earlier filing date of the '302 First Provisional.

[10] This page number refers to the annotated page number of exhibit HONDA-1013.

A person of ordinary skill in the art as of the Critical Date of the '302 Patent ("POSITA") would have had at least a Bachelor's degree in an academic area emphasizing electrical engineering, computer engineering, or a similar discipline, and at least two years of experience in the field working with, teaching, or researching wireless communication networks. HONDA-1003, ¶ 22. Superior education could compensate for a deficiency in work experience, and vice-versa. *Id*.

II. THE '302 PATENT

A. Brief Description

The '302 Patent describes a system in which "a spread spectrum signal is intentionally overlapped with an OFDM signal" and is directed to "methods and techniques to ensure that the mutual interference between the overlapped signals is minimized to have insignificant impact on either signal and that both signals are detectable with expected performance by a receiver". HONDA-1001, Abstract.

The '302 Patent describes a broadband wireless communication system where both Multi-Carrier (MC) and Direct Sequence Spread Spectrum (DSSS) signals are overlaid together in both time and frequency domains. HONDA-1001, 2:39-42. The DSSS signal overlaps with the MC signal in the time domain, so that the overlaid signal can be aligned at the boundary of MC slot or MC symbol when they are synchronized. HONDA-1001, 4:30-33. In the frequency domain, the DSSS signal is designed to have spectrum nulls at the MC signal to reduce interference with MC control signals. HONDA-1001, 7:54-8:2.

The DSSS signal can be used for various purposes, such as "initial random access, channel probing, and short messaging." HONDA-1001, 2:46-48. In the context of channel probing, the DSSS signal (which is transmitted by a mobile station to a base station) is used to "assist estimation of channel characteristics" in scenarios where "the mobile station is already synchronized in time and frequency with the base station." HONDA-1001, 8:65-9:2. Furthermore, channel probing enables the base station to get "an update of the mobile station's information such as transmission timing and power from the probing DSSS signal." HONDA-1001, 9:42-45.

B. Prosecution History

During prosecution of the '302 Patent, the claims were rejected only under 35 U.S.C. § 112 for lack of support and under double-patenting. HONDA-1002. The claims never faced a prior art rejection, and the Examiner did not consider or substantively apply 802.16a-2003, 802.16-2001, Kitroser, or Koo.

III. THE CHALLENGED CLAIMS ARE UNPATENTABLE

As detailed below, this request shows a reasonable likelihood that Petitioner will prevail with respect to the Challenged Claims.

Both grounds presented in this petition share the same primary reference 802.16a but differ in the secondary references (Koo in the 1st ground, and Kitroser in the 2nd ground). 802.16a teaches all limitations of the Challenged Claims, except for the claimed preamble feature that a device is "mobile." The two secondary references Koo and Kitroser both show that a POSITA would have known, prior to the Critical Date

and even earlier, that it was obvious to implement the relevant teachings of 802.16a in a "mobile" device. In particular, Kitroser (in the 2nd ground) shows that this knowledge was prevalent even before the earlier filing date of the '302 First Provisional.

A. GROUND 1 – 802.16a and Koo Render Obvious Claims 23, 24, 26, and 27[11]

802.16a discloses all features of the Challenged Claims except for a device that is "mobile." HONDA-1003, 29. However, a POSITA would have understood, prior to the Critical Date, that the relevant teachings of 802.16a are directly applicable to a "mobile" wireless environment, as taught by Koo. HONDA-1003, 29.

1. 802.16a Overview

802.16a is an IEEE communications standard that specifies an "air interface for fixed broadband wireless access systems." HONDA-1004, title. The standard is defined in two documents – 802.16a-2003 (HONDA-1004) and 802.16-2001 (HONDA-1005) – which will hereinafter collectively be referred to as "802.16a." HONDA-1003, 30. The 802.16a-2003 document "amends IEEE Std 802.16-2001 by enhancing the medium access control layer and providing additional physical layer

[11] General descriptions provided for the references and combinations discussed in Section III.A are incorporated into each subsection addressing/applying those references, as are the discussions of combinations.

specifications in support of broadband wireless access at frequencies from 2-11 GHz." HONDA-1004, p.3; HONDA-1003, 30. The resulting standard is referred to herein simply as "802.16a."

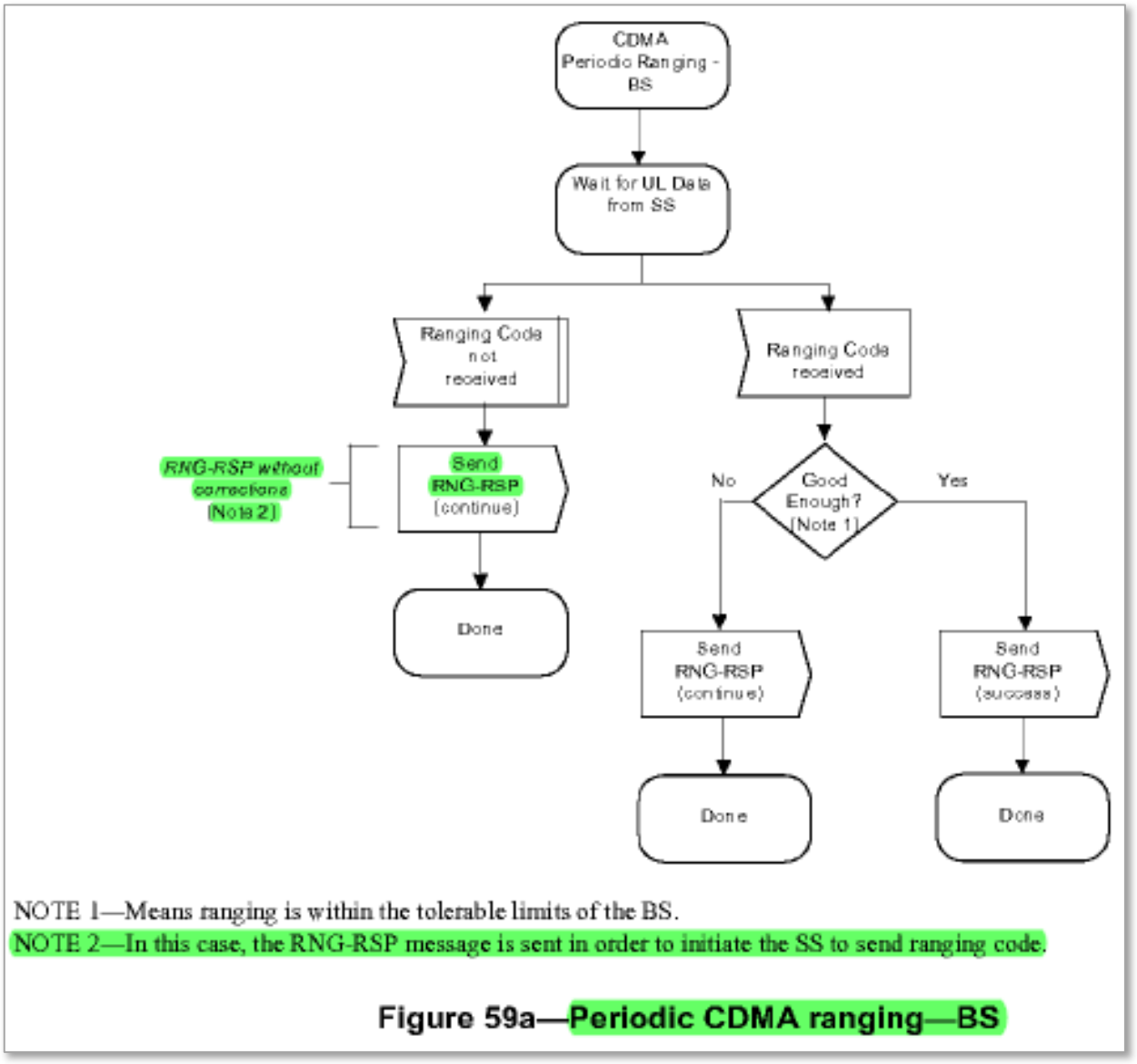
802.16a describes a "ranging transmission[s]" (which include a "ranging code") by a subscriber station (SS) to a base station (BS). HONDA-1004, Table 63b, FIG. 59c; HONDA-1003, 31. The ranging transmission (including a ranging code) is used for three different purposes, "initial-ranging, periodic-ranging and bandwidth-requests." HONDA-1004, 8.5.7.3, p.203[12] (3rd paragraph); HONDA-1003, 31.

In particular, "periodic ranging" enables the SS to periodically adjust its transmission parameters so the SS can communicate with the BS properly. HONDA-1004, § 6.2.10, p.80; HONDA-1003, 32. To that end, the SS periodically performs a ranging transmission (which includes a ranging code modulating subcarriers in a frequency domain) to the BS, thus allowing the BS to acquire "vast information about the user channel and condition." HONDA-1004, § 6.2.10, p.80, and § 8.5.7, pp.201-203; HONDA-1003, 32. Based on this channel information, the base station is able to periodically update the SS's "time and power parameters" and inform the SS of the updated parameters to "ensure changes in the channel can be accommodated." HONDA-1004, 8.5.10.2; HONDA-1003, 32. This enables the BS "to adjust

[12] Henceforth the cited page numbers of HONDA-1004 will refer to the page numbers printed on the original document.

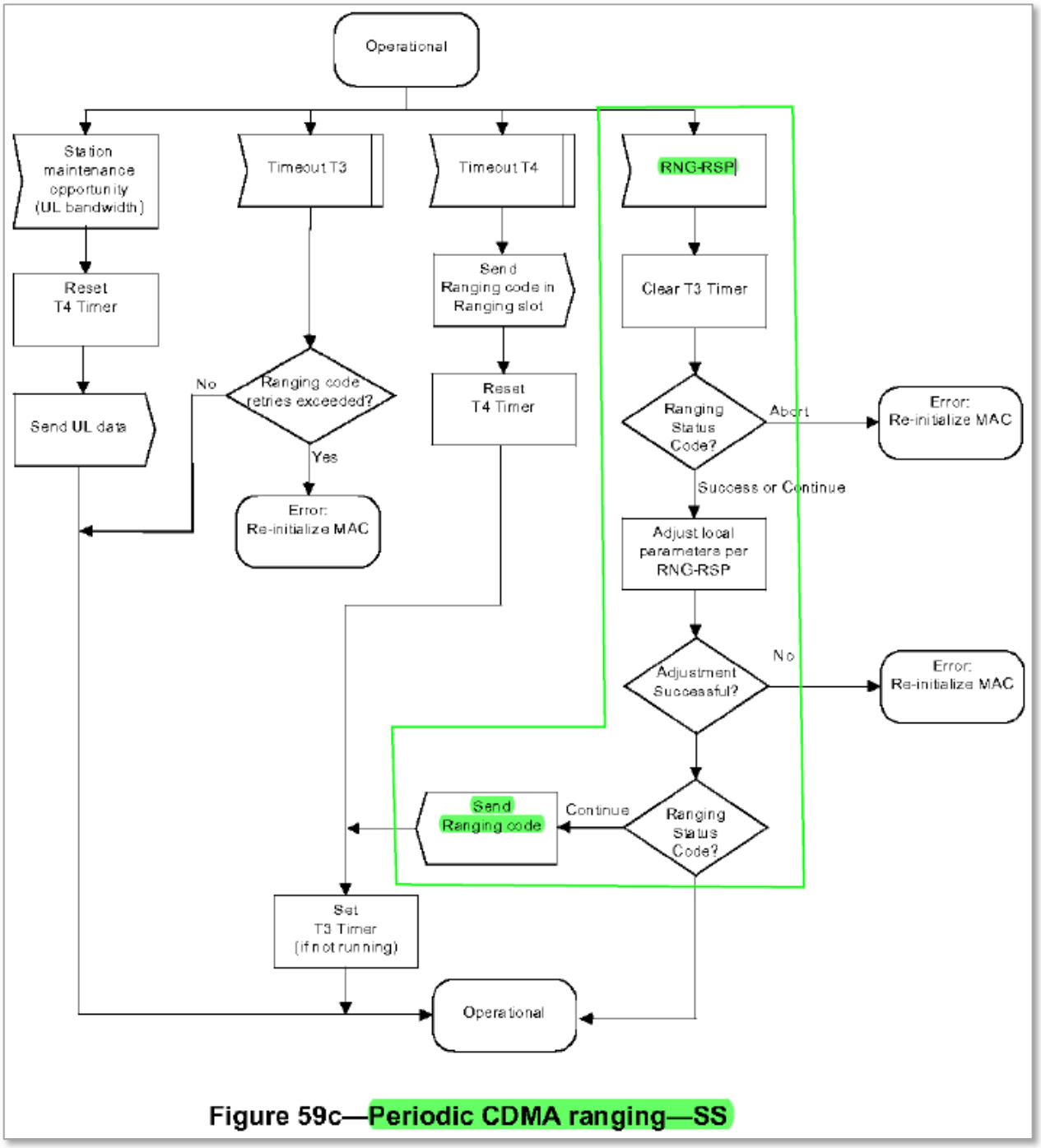
transmission parameters so the SSs can communicate with the BS properly." HONDA-1004, 6.2.10, p. 80; HONDA-1003, 32.

In the OFDMA implementation of 802.16a (which is "based on OFDM modulation"), the periodic ranging process is referred to as "periodic CDMA ranging." HONDA-1004, 8.5 (p. 179), 6.2.10.2 (p. 84); HONDA-1003, 33. During periodic CDMA ranging, the BS sends an "RNG-RSP" message to the SS "in order to initiate the SS to send a ranging code." HONDA-1004, 6.2.10.2, FIGS. 59a and 59c (pp. 84-86); HONDA-1003, 33. An example of the BS sending an RNG-RSP message to the SS is shown in FIG. 59a (below, annotated).



802.16a-2003, FIG. 59a (annotated)

At the receiving end of the RNG-RSP, 802.16a discloses that the SS receives the RNG-RSP message from the BS and transmits the "ranging code" in response to the BS. HONDA-1004, FIG. 59c; HONDA-1003, 34. An example of the SS receiving the RNG-RSP message and responding by transmitting a ranging code is shown in FIG. 59c (below, annotated). *Id*.

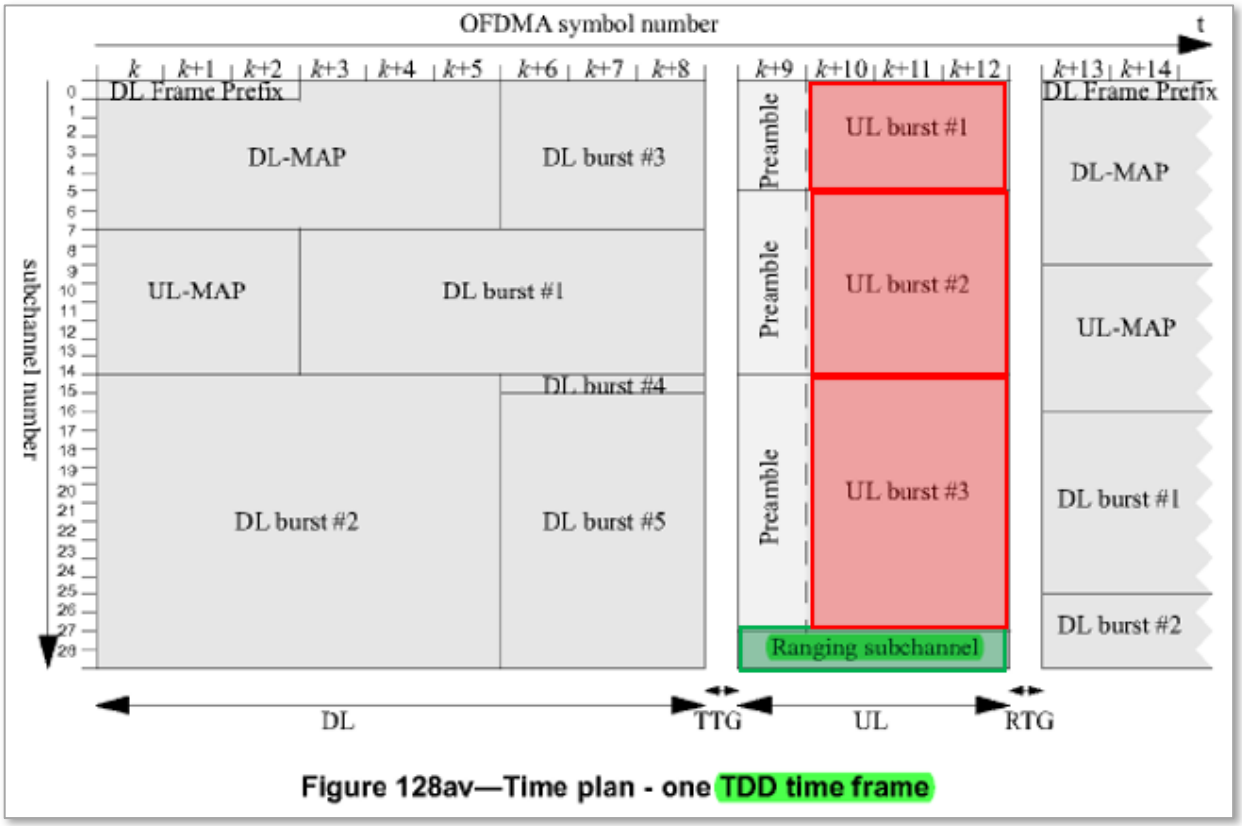


802.16a-2003, FIG. 59c (annotated)

In the periodic CDMA ranging process of 802.16a, the ranging code is a "subsequence" of a "pseudo-noise sequence" whose "bits are used to modulate the subcarriers in a pair of adjacent subchannels" in the frequency domain. HONDA-

1004, § 8.5.7.3, pp. 202-203; HONDA-1003, 35. The CDMA ranging code is used to modulate specific subcarriers in BPSK modulation and is transmitted over a "ranging channel," which is composed of one or more pairs of adjacent subchannels defined during a particular range of symbol offsets in the time domain. HONDA-1004, 8.5.7, FIG. 128av; HONDA-1003, 35.

802.16a defines a "frame structure" including both a downlink ("DL") portion and an uplink ("UL") portion. HONDA-1004, 8.5.4, FIG. 128av (below, annotated); HONDA-1003, 36.



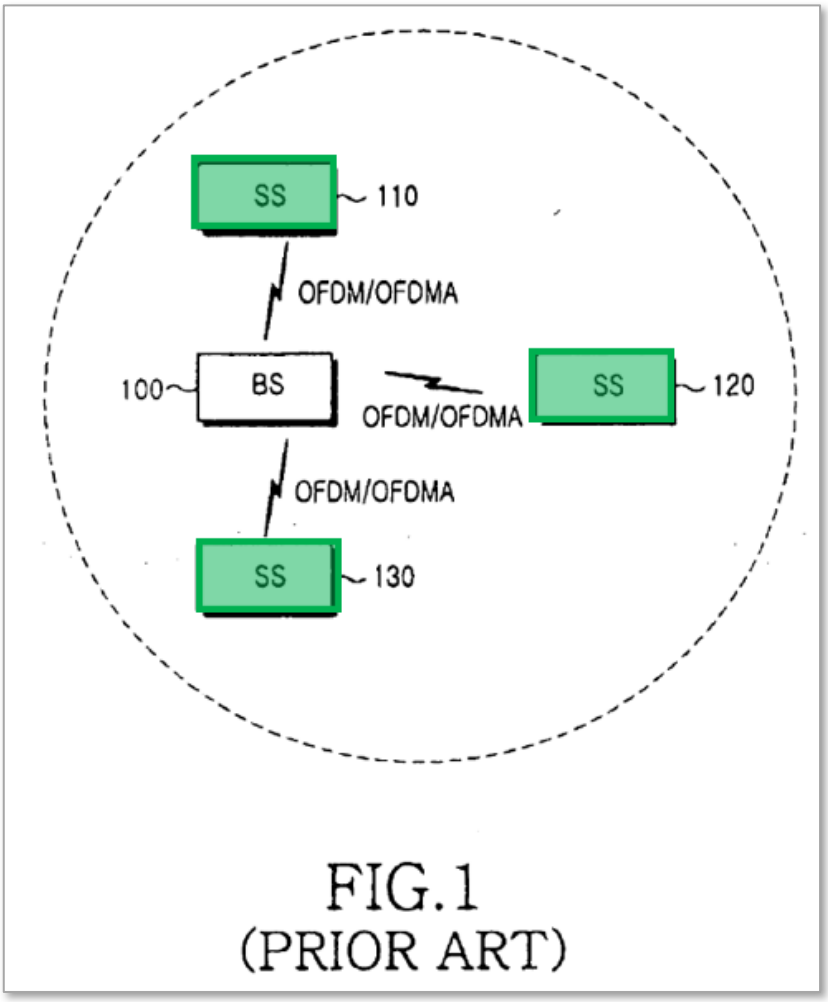
802.16a-2003, 128av (annotated)

In the uplink (UL) portion of the frame, the ranging channel is allocated for transmission of the ranging code while the other subchannels are allocated for user

transmissions. HONDA-1004, 8.5.4.6; HONDA-1003, 37. In particular, FIG. 128av above shows a "ranging subchannel" (for ranging code transmissions) and various "UL bursts" (for user transmissions) that are allocated within the uplink (UL) portion of the frame. HONDA-1004, 8.5.4, FIG. 128av; HONDA-1003, 37.

2. Koo Overview

Koo discloses a communication system using an OFDM/OFDMA scheme. HONDA-1006, [0007]; HONDA-1003, 38. Koo's system includes a base station (e.g., "BS 100" in FIG. 1) and subscriber stations (e.g., "SSs 110, 120, and 130" in FIG. 1) that communicate using the OFDM/OFDMA scheme. HONDA-1006, [0006], [0009], FIG. 1 (below, annotated); HONDA-1003, 38.



Koo, FIG. 1 (annotated)

Koo describes two IEEE 802.16 standards that were "currently considered" at the time, namely the "IEEE 802.16**a**" standard and the "IEEE 802.16**e**" standard. HONDA-1006, [0006]; HONDA-1003, 39. Koo explains that the IEEE 802.16a standard is specified for a "fixed state of a current SS" with "no consideration given to the mobility of the SS." HONDA-1006, [0026]; HONDA-1003, 39. With the goal of introducing "mobility" into the IEEE 802.16a standard, Koo discloses that the newer IEEE 802.16e standard "has been defined as a system for considering the SS's **mobility** in the IEEE 802.16a communication system, such that the IEEE 802.16e

communication system must consider the SS's mobility." *Id*. However, Koo explains that "there is no detailed specification yet for the IEEE 802.16e communication system" and therefore, to introduce mobility into the IEEE 802.16a standard, Koo discloses that certain "operations modes" of the SS and BS "must be converted into others" to accommodate the "SS's mobility." *Id*.

In particular, Koo focuses on the "ranging process" of the IEEE 802.16a/ IEEE 802.16e standard. As background, Koo discloses that the "communication system currently considered in IEEE 802.16a and IEEE 802.16e specifications acts as a specific communication system for performing a ranging operation between the SS and a base station (BS)." HONDA-1006, [0006]; HONDA-1003, 40. Koo describes "three ranging processes for use in the IEEE 802.16a/IEEE 802.16e communication system" namely "an initial ranging process, a maintenance ranging process (also called a period ranging process), and a bandwidth request ranging process." HONDA-1006, [0019]; HONDA-1003, 40.

Among these three types of ranging, Koo describes modifying the "initial ranging process" to implement a "handoff method" so as to guarantee the SS's "mobility." HONDA-1006, [0027]-[0028]; HONDA-1003, 41. In particular, Koo explains that "IEEE 802.16e communication system can provide the SS's mobility on the condition that the handoff operation for the SS 430 is supported." HONDA-1006, [0048]; HONDA-1003, 41. To that end, in order to support the handoff operation, Koo "provides the SS with the handoff-associated information using the DL MAP message

for use in the IEEE 802.16a communication system" by adding "the handoff-associated information in an additional field" of the DL-MAP message. HONDA-1006, [0049]; HONDA-1003, 41. This additional handoff-associated information is then used during a modified initial ranging process to ensure that the mobile SS is able to synchronize with the correct BS as the SS moves between different cells. HONDA-1006, FIG. 5, [0051]-[0058]; HONDA-1003, 41.

Therefore, Koo discloses that "mobility" of an SS can be guaranteed by modifying the "initial ranging process" of the IEEE 802.16a standard to utilize additional information provided in the DL-MAP message so that the SS can initially synchronize with the correct BS. HONDA-1003, 42. Once the initial ranging process is completed, the SS (which has synchronized with a BS to control time offset and power) thereafter periodically performs the traditional "periodic ranging process" specified in the IEEE 802.16a standard to control a channel state. HONDA-1006, [0023]; HONDA-1003, 42.

Thus, among the three types of ranging processes in the IEEE 802.16a standard, Koo discloses that only the "initial ranging" process needs to be modified in order to guarantee mobility of an SS. HONDA-1003, 43. The "periodic ranging process" is described by Koo as being identical in both the IEEE 802.16a standard and the IEEE 802.16e standard. HONDA-1006, [0019], [0023]; HONDA-1003, 43. Therefore, Koo makes clear that the "periodic ranging process" specified in the IEEE 802.16a standard would remain unchanged even when accommodating "mobility" for SSs in the newer

IEEE 802.16e standard. HONDA-1003, 43.

In particular, for both the fixed-wireless IEEE 802.16a standard and the mobile-wireless IEEE 802.16e standard, Koo explains that the "period ranging process is periodically executed" so that the SS "can control a channel state associated with the BS." HONDA-1006, [0023]; HONDA-1003, 44. Koo discloses that the IEEE 802.16a and IEEE 802.16e standards define "one ranging channel" that "includes two ranging sub-channels" and explains that "the ranging procedure requires a plurality of ranging sub-channels and a plurality of ranging codes." HONDA-1006, [0020]; HONDA-1003, 44.

3. The Combination of 802.16a-2003 and 802.16-2001 (collectively "802.16a")

A POSITA would have found it obvious to combine 802.16a-2003 and 802.16-2001 based on explicit statements in 802.16a-2003. HONDA-1003, 45. For example, 802.16a-2003 explains that it "amends IEEE Std 802.16-2001." HONDA-1005, i, iii[13]. 802.16a-2003 also provides editing instructions that "define how to merge the material contained herein into the existing base standard (IEEE Std 802.l6TM-2001) to form the comprehensive standard." *Id*., 1. These explicit statements would have motivated a POSITA to combine 802.16a-2003 with 802.16-2001 to form a single document/standard, referred to herein as "802.16a." HONDA-1003, 45.

[13] These page numbers refer to the page numbers printed on the original document.

4. The Combination of 802.16a and Koo

As discussed above, 802.16a is directed to "fixed broadband wireless access systems" with stationary SSs operating according to the IEEE 802.16a standard. HONDA-1003, 46. Also as discussed above, Koo shows that, prior to the Critical Date, it was well-known to introduce "mobility" into the IEEE 802.16a standard, resulting in the newer "IEEE 802.16e" standard for mobile wireless communications. HONDA-1003, 46. Furthermore, as discussed above, Koo teaches that the "periodic ranging process" of the IEEE 802.16a standard would not require any changes for use with mobile SSs in the IEEE 802.16e standard. HONDA-1003, 46. Therefore, a POSITA would have understood that the "periodic CDMA ranging" process of 802.16a is directly applicable to **mobile** SSs, as taught by Koo. HONDA-1003, 46.

Specifically, as discussed above, Koo discloses that both the fixed-wireless IEEE 802.16a standard and the mobile-wireless IEEE 802.16e systems implement the same "periodic ranging process." HONDA-1006, [0019]-[0023]; HONDA-1003, 47. For both the IEEE 802.16a and IEEE 802.16e communication systems, Koo discloses that "ranging codes" for a "periodic ranging process" are generated by a "pseudorandom noise" sequences over two ranging sub-channels. HONDA-1006, [0021]; HONDA-1003, 47.

The details in Koo regarding the "periodic ranging process" are consistent with those in 802.16a. HONDA-1003, 48. For example, the **structure** of the ranging codes is the same in both Koo and 802.16a. HONDA-1003, 48. As discussed above, Koo's

ranging codes are created by "segmenting a **PN** (**Pseudorandom Noise**) sequence" over a "**ranging channel**" that includes up to "**two** ranging **sub-channels**" such that each of segmented codes has a "length of **106 bits**" with "a maximum of **48 ranging codes** … assigned to the SS." HONDA-1006, [0021]; HONDA-1003, 48. This is consistent with 802.16a's description that CDMA binary ranging codes are "**pseudo-noise (PN)** codes" and in particular are "**subsequences** of the pseudo-noise sequence" where the "length of each ranging code is **106 bits**" that "modulate the sub-carriers in a **pair** of adjacent **subchannels**" called a "**ranging channel**" and where the "**number** of available codes is **48**." HONDA-1004, § 8.5.7.3, pp. 202-203; HONDA-1003, 48.

Furthermore, the **usage** of the ranging codes is the same in both Koo and 802.16a. HONDA-1003, 49. As discussed above, Koo discloses that the "ranging code is differently assigned to the SS according to each objective of the **three ranging processes**." HONDA-1006, [0021]; HONDA-1003, 49. For example, Koo explains that "**N** ranging codes are assigned to the SS for the **initial** ranging process … **M** ranging codes are assigned to the SS for the **periodic** ranging process … and **L** ranging codes are assigned to the SS for the **bandwidth request** ranging process." HONDA-1006, [0022]; HONDA-1003, 49. This is consistent with 802.16a's description that the ranging codes are "divided in **three usage groups** (initial ranging, periodic-ranging and bandwidth-request ranging)" and codes are "allocated dynamically to the groups by the BS" such that the "first **N** codes produced are for **initial**-ranging" and the "next **M** codes produced are for **periodic**-ranging" and the "next **L** codes produced are for

bandwidth-requests." HONDA-1004, § 8.5.7.3, p. 203; HONDA-1003, 49. In addition, Koo explains that the periodic ranging process is used so that the SS "can control a **channel state** associated with the BS." HONDA-1006, [0023]; HONDA-1003, 49. This is consistent with 802.16a's description that the periodic ranging process enables the BS to obtain the "**Channel Impulse Response** (CIR)" and acquire "vast information about the user **channel** and **condition**" so as to "ensure **changes in the channel** can be accommodated." HONDA-1004, § 8.5.7.3, p. 203; § 8.5.10.2, p. 219; HONDA-1003, 49.

Therefore, both 802.16a and Koo describe the same "periodic ranging" process in which an SS periodically transmits a "PN (Pseudorandom Noise) sequence" over a "ranging channel" (comprised of a pair of adjacent subchannels) for the purpose of adapting to changing channel state conditions. HONDA-1003, 50. Furthermore, Koo makes clear that this "periodic ranging" process is identical for both the IEEE 802.16a (fixed wireless) and IEEE 802.16e (mobile wireless) communication systems. HONDA-1003, 50.

As the Buehrer Declaration explains, applicability of the 802.16a periodic ranging process to mobile environments was well-known in the art prior to the Critical Date, for example as evidenced by extensive efforts that were underway to develop the mobile-wireless IEEE 802.16e standard. HONDA-1003, 51. For example, as the Buehrer Declaration explains, it was well-known that the development of the IEEE 802.16e standard (mobile WiMax) prior to the Critical Date was an effort to support

mobility and to fill the gap between fixed wireless local area networks and mobile cellular systems. HONDA-1003, 51 (citing Jun-Bae Seo, Seung-Que Lee, Nam-Hoon Park, Hyong-Woo Lee and Choong-Ho Cho, "Performance analysis of sleep mode operation in IEEE 802.16e," IEEE 60th Vehicular Technology Conference, 2004. VTC2004-Fall. 2004, Los Angeles, CA, USA, 2004, pp. 1169-1173 Vol. 2, doi: 10.1109/VETECF.2004.1400205. – "Additionally, IEEE802.16e is a standard in progress for BWA in order to support mobility, which may fill the gap between fixed wireless local area networks and mobile cellular systems"). Further, the Buehrer Declaration explains that it was well-known that the PHY layer periodic ranging mechanism of the existing IEEE 802.16a standard (for fixed wireless devices) would remain unchanged in a mobile environment. HONDA-1003, 51 (citing to Kitroser as discussing the "impact of the mobile environment on the current 802.16a" standard and making the unequivocal statement that for the "Ranging" process, "[n]o changes are required in the PHY layer ranging mechanism." HONDA-1007, p. 3 (§ 3)).

As a result, a POSITA would have understood, in view of the teachings of Koo and the general knowledge of a POSITA prior to the Critical Date, that the "periodic CDMA ranging" process described in 802.16a would have been directly applicable to **mobile** devices. HONDA-1003, 52.

5. Claim 23 is obvious over 802.16a in view of Koo

Claim 23

[23.P] "A mobile device in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the mobile device comprising:"

To the extent the preamble is deemed limiting, the combination of 802.16a and Koo renders it obvious. As previously discussed, the combination of 802.16a and Koo teaches a mobile subscriber station, or SS (the claimed "*mobile device*"), in a communication system that is based on **OFDM** modulation. HONDA-1003, 53.

Thus, the combination of 802.16a and Koo teaches "*a mobile device in an Orthogonal Frequency Division Multiplexing (OFDM) communication system*" as recited in claim feature [23.P]. HONDA-1003, 54.

[23.1] "a receiver configured to receive a request for a probing signal from a base station in the system;"

As described above, 802.16a teaches a "periodic CDMA ranging" process in which the SS performs "periodic **ranging transmissions**" to the BS, where each ranging transmission includes a "ranging code" that enables the BS to acquire information about the user channel condition. HONDA-1004, § 6.2.10, p. 80, § 8.5.7, pp. 201-203; HONDA-1003, 55. As explained in further detail below, the "ranging transmission" of 802.16a renders obvious the claimed "*probing signal*." HONDA-1003, 55.

In addition, as explained above and in further detail below, during periodic CDMA ranging, if the BS does not receive the ranging code or if the BS receives a ranging code that is "not good enough," then the BS sends an "**RNG-RSP** message"

with a "ranging status code" that is set to the special status code "**continue**" to the SS "in order to initiate the SS to send a ranging code." HONDA-1003, 56. Therefore, as explained further below, the 802.16a "RNG-RSP" message with special ranging status code "continue" renders obvious the claimed "*request*" for the probing signal. HONDA-1003, 56.

(i) "a probing signal"

The '302 Patent specification does not use the term "*probing signal.*" HONDA-1003, 57. Instead, the '302 Patent describes a "Direct Sequence Spread Spectrum (**DSSS**) signal" that can be used for "**channel probing**." HONDA-1001, 2:40-41, 46-47; HONDA-1003, 57.

A POSITA would have understood that 802.16a's periodic CDMA "**ranging transmission**" (which includes a "ranging code") renders obvious the claimed "*probing signal.*" HONDA-1003, 58. In particular, 802.16a's description of the ranging code (and how the ranging code is used) is consistent with '302 Patent's description of the "Direct Sequence Spread Spectrum (DSSS) signal" which can be used for "channel probing" (the claimed "*probing signal*"). HONDA-1001, 2:40-41, 46-47; HONDA-1003, 58.

For example, the **structure** of the 802.16a "ranging transmission" is consistent with the '302 Patent's "DSSS signal." HONDA-1003, 59. 802.16a describes the process of periodic ranging as "periodic **CDMA** ranging" and describes "periodic ranging codes" as consisting of "periodic ranging **CDMA** codes." HONDA-1004, FIG. 59c,

Table 122; HONDA-1003, 59. This is consistent with the '302 Patent which describes the **DSSS** (probing signal) as using "**spreading** codes" (HONDA-1001, col. 1, lines 30-31) and the DSSS signal (probing signal) having a "**spreading** factor" (HONDA-1001, col. 6, lines 6-7). HONDA-1003, 59. A POSITA would have understood that a "CDMA code" (as taught in 802.16a) is a "spreading code" that has a "spreading factor" (as described in the '302 Patent). HONDA-1003, 59 (citing Hall, HONDA-1009, as disclosing a system that provides "synchronous **direct-sequence** code division multiple access (DS-**CDMA**)" and in particular where the "modulation is direct-sequence spread-spectrum (**DS-SS**)").

As another example, the **purpose** of the 802.16a "ranging transmission" is consistent with the '302 Patent's DSSS signal. HONDA-1003, 60. For example, 802.16a describes "code detection" for periodic ranging, in which the BS can "extract **timing** (ranging) **information** and **power**" from the detected ranging code, and "the BS gets the **Channel Impulse Response** (CIR) of the code, thus acquiring for the BS vast information about the user **channel** and **condition**." HONDA-1004, 8.5.7.3; HONDA-1003, 60. This is consistent with the '302 Patent which describes that the BS gets "information such as transmission **timing** and **power** from the probing DSSS signal." HONDA-1001, 9:43-45; HONDA-1003, 60. The '302 Patent also describes the DSSS signal is used "to derive the **channel information** in the case of channel probing." HONDA-1001, 5:22-25; HONDA-1003, 60.

As yet another example, the **context** of performing the 802.16a "ranging transmission" is consistent with the context in which the '302 Patent's DSSS signal is used. HONDA-1003, 61. For example, 802.16a describes that "**periodic-ranging** transmissions" are "sent only by SS that have **already synchronized** to the system." HONDA-1004, 8.5.7.2; HONDA-1003, 61. This is consistent with the '302 Patent's description that the "channel **probing**" embodiment of the **DSSS signal** is used in the case where "the mobile station is **already synchronized** in time and frequency with the base station." HONDA-1001, 8:65-9:4; HONDA-1003, 61.

For these various reasons, a POSITA would have understood that 802.16a's "ranging transmission" renders obvious the claimed "*probing signal.*" HONDA-1003, 62.

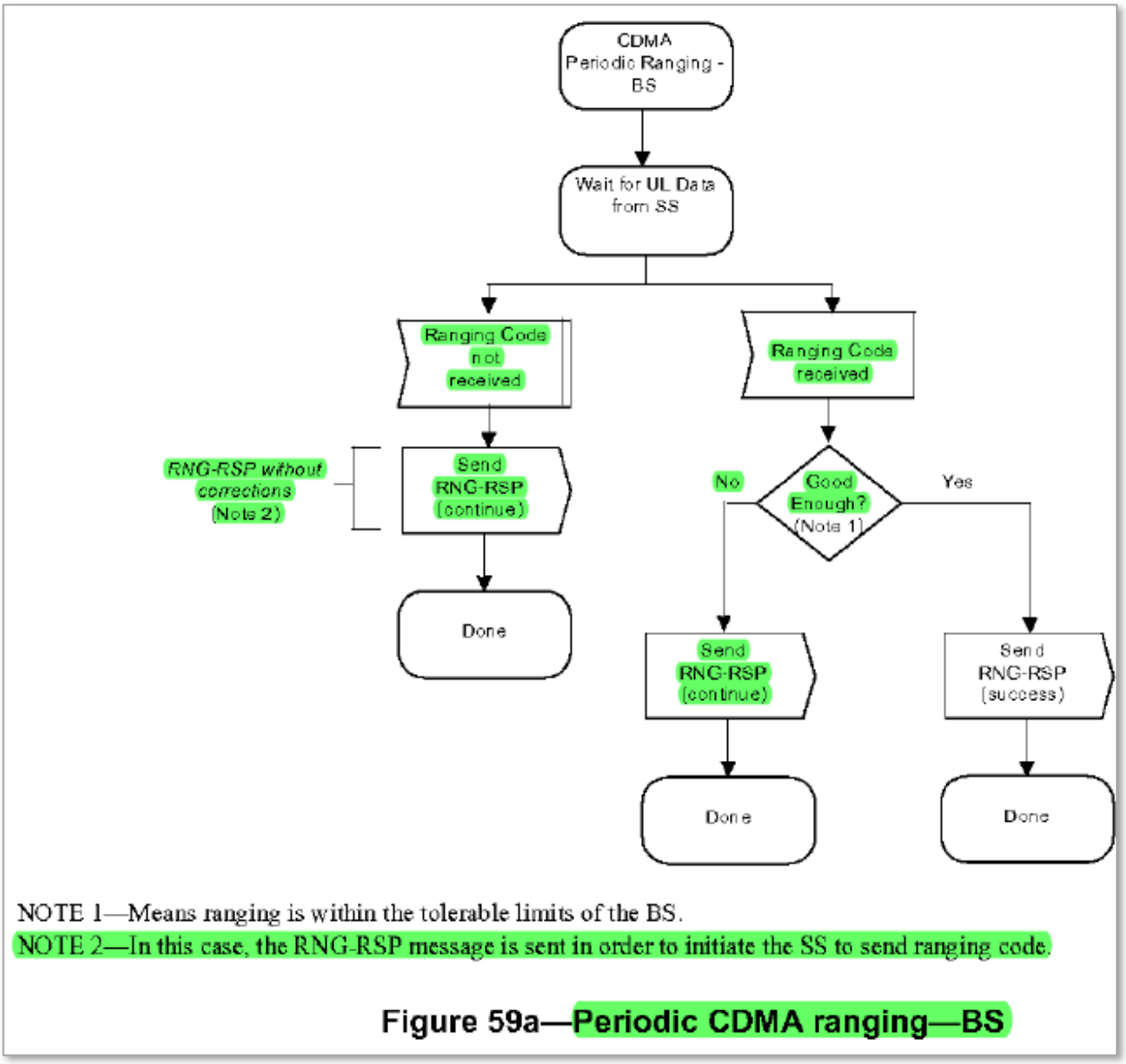
(ii) "a *request* for a probing signal"

The '302 Patent specification does not use the term "*request*" for a probing signal. HONDA-1003, 63. Instead, the '302 Patent describes that the base station **dictates** the mobile station to transmit the **channel probing DSSS** when it needs an update of the mobile station's channel characteristics." HONDA-1001, 9:39-41; HONDA-1003, 63.

A POSITA would have understood 802.16a teaches that the BS sends a **request** for the SS to perform the ranging transmission, and that this is consistent with the description of the '302 Patent and consistent with a POSITA's understanding of the term "request." HONDA-1003, 64. For example, as discussed above, during the

periodic CDMA ranging process of 802.16a, the SS performs periodic ranging transmissions by periodically sending a "ranging code" to the BS. HONDA-1003, 64. However, as discussed above, if the BS **does not receive** a ranging code or if the BS receives a ranging code that is **not good enough**, then the BS sends an "**RNG-RSP** message" with a special "ranging status code" of "**continue**" to the SS "in order to **initiate** the SS to send a **ranging code**." HONDA-1004, FIG. 59a (below, annotated); HONDA-1003, 64. This is explained in further detail below.

In particular, FIG. 59a of 802.16a shows a flow chart of the BS's operations during the periodic CDMA ranging process. *Id*.; HONDA-1003, 65. As shown on the left-hand branch of the flow chart in FIG. 59a, if the BS detects "Ranging Code **not received**" then the BS proceeds to "Send **RNG-RSP** (**continue**)." *Id*. As seen in the "NOTE 2" at the bottom of FIG. 59a, 802.16a explains that "In this case, the RNG-RSP message is sent in order to **initiate** the SS to send **ranging code**." *Id*. Alternatively, as shown on the right-hand branch of the flow chart in FIG. 59a, if the BS detects "Ranging Code **received**," then the BS checks whether the ranging code is "Good Enough?" (as explained in Note 1, this means checking whether the "ranging is within the tolerable limits of the BS"). *Id*. If the ranging code is **not** good enough (*i.e.*, "No" in the flow chart), then the BS proceeds to "Send **RNG-RSP** (**continue**)." *Id*., *see also* FIG. 59b (below, annotated); HONDA-1003, 65.



802.16a-2003, FIG. 59a (annotated)

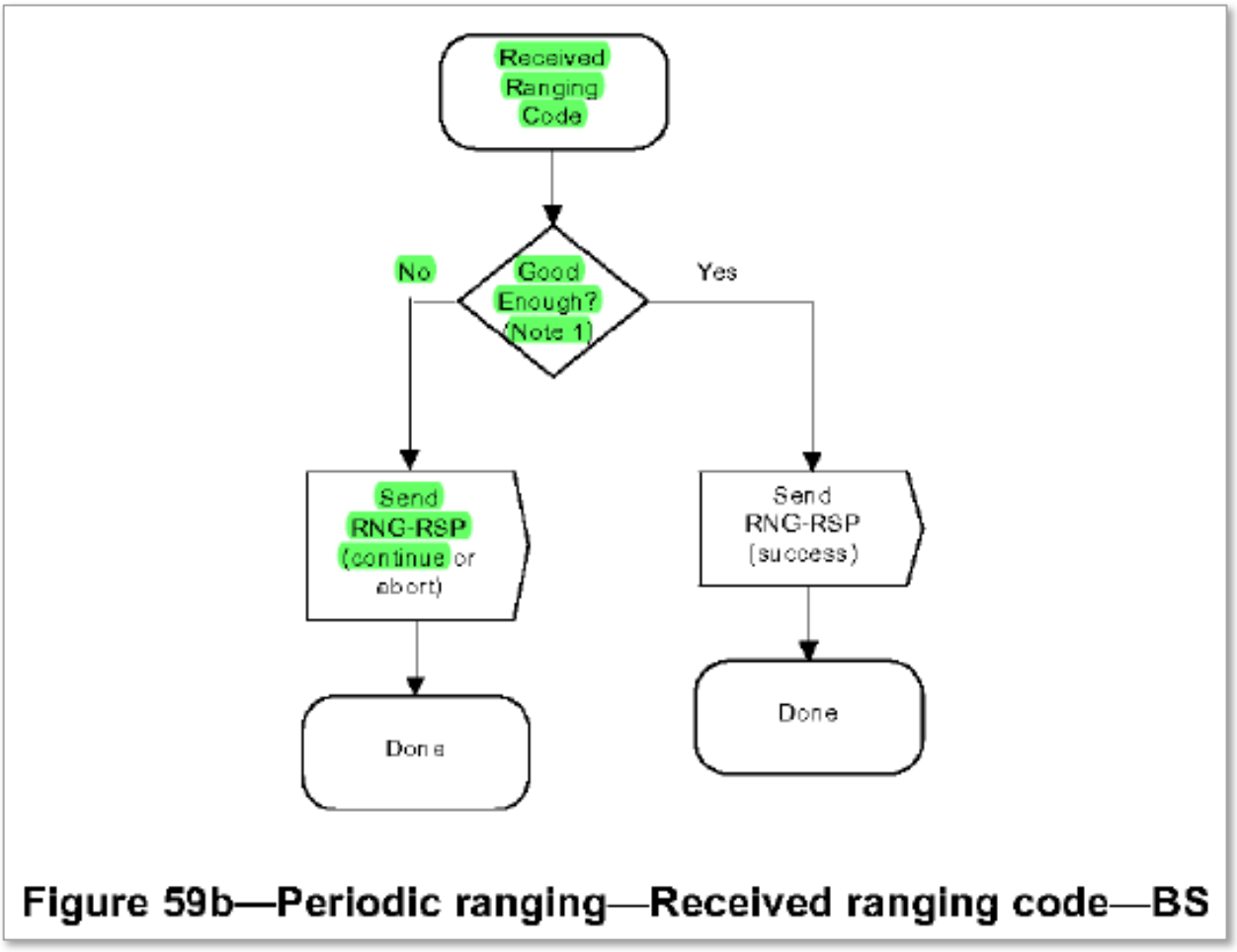


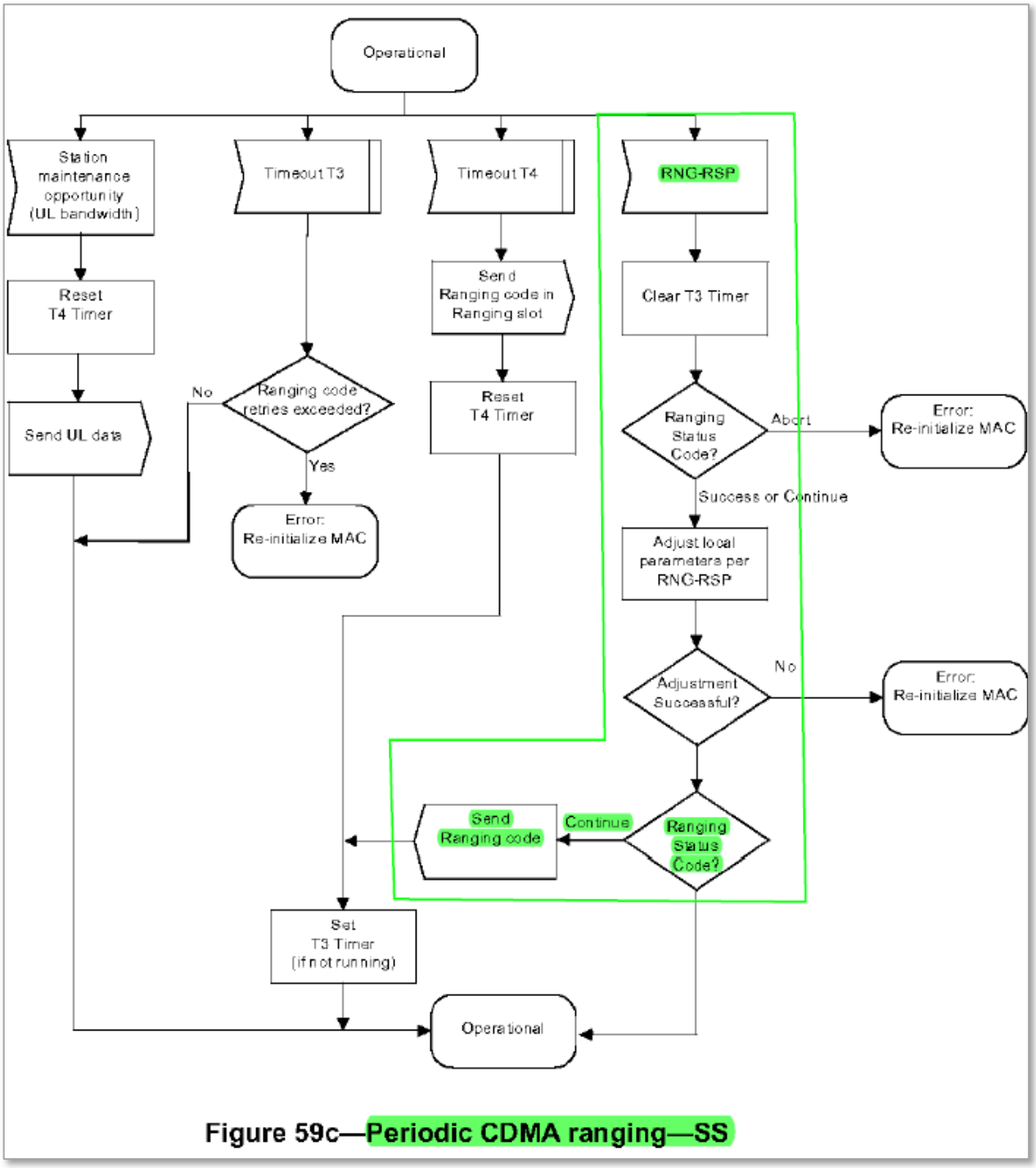
Figure 59b—Periodic ranging—Received ranging code—BS

802.16a-2003, FIG. 59b (annotated)

Therefore, as seen above, during the periodic CDMA ranging process, if the BS **does not receive** a ranging code or of the BS receives a ranging code that is **not good enough**, then the BS sends an "**RNG-RSP** message" with a special status code "**continue**" to the SS "in order to **initiate** the SS to send a **ranging code**." HONDA-1003, 66. This use of the RNG-RSP message with the status code "continue" is consistent with what a POSITA would understand to be a "request for a probing signal." *Id*.

The corresponding operations of the SS are shown in the flow chart of FIG. 59c

of 802.16a (below, annotated). As shown on the left-hand side of the flow chart, the periodic CDMA ranging process involves the SS using various timers (*e.g.*, T3 and T4) to control the periodic ranging transmissions of the ranging code. HONDA-1003, 67. However, as shown on the right-hand side of the flow chart (annotated), when the SS receives an RNG-RSP message from the BS, then the SS checks whether the "Ranging Status Code" of the RNG-RSP is set to the special status code of "Continue." HONDA-1004, FIG. 59c (below, annotated); HONDA-1003, 67. If so, then the SS will "send Ranging code." *Id*.



802.16a-2003, FIG. 59c (annotated)

Therefore, 802.16a discloses that, during the periodic CDMA ranging process, if the SS receives an RNG-RSP message with special status code of "Continue," then the SS will send a ranging code to the BS (irrespective of the timers T3 and T4 that are

typically used to control the SS's periodic ranging transmissions). HONDA-1003, 68.

Therefore, because the BS transmits the RNG-RSP message with ranging status code "continue" when the BS fails to receive a ranging code or when the BS receives a ranging code that is not good enough, and because this RNG-RSP message with ranging status code "continue" will "initiate" the SS to send a ranging code, a POSITA would have understood that an SS receives, from a BS, an "RNG-RSP" message with a ranging status code "continue" as a "**request**" for a ranging transmission which includes a ranging code. HONDA-1003, 69. Furthermore, because the purpose of the BS initiating the SS to send the ranging code is for the BS to acquire "vast information about the user channel and condition" (HONDA-1004, § 6.2.10, p. 80, and § 8.5.7.3, p. 203), this is also consistent with the '302 Patent's description that "the base station dictates the mobile station to transmit the channel probing DSSS when it needs an update of the mobile station's channel characteristics." HONDA-1001, 9:39-41; HONDA-1003, 69. That is, in both 802.16a and in the '302 Patent, the base station initiates/dictates the SS/mobile station to send a signal (the "ranging transmission" in 802.16a and the "channel probing DSSS" signal in the '302 Patent) when the BS needs to acquire a user's channel information. HONDA-1003, 69.

Moreover, 802.16a teaches that the SS implements a "receiver" for receiving downlink signals from the BS. HONDA-1003, 70. For example, 802.16a discloses "[i]n the DL, a subchannel may be intended for different (groups of) receivers." HONDA-1004, 8.5.2.2 (p. 180); HONDA-1003, 70. 802.16a also specifies various

"receiver requirements." HONDA-1004, 8.5.13; HONDA-1003, 70. Additionally, a POSITA would understand that the entire 802.16a specification assumes that the signals and processes described require a receiver at each end of the wireless link. HONDA-1003, 70.

Thus, for the various reasons discussed above, the combination of 802.16a and Koo teaches "*a receiver configured to receive a request for a probing signal from a base station in the system*" as recited in claim feature [23.1]. HONDA-1003, 71.

[23.2] "a transmitter configured to form and transmit, in response to the received request, the probing signal with a code sequence modulated in the frequency domain, wherein:"

As discussed for claim feature [23.1], 802.16a specifies a "ranging transmission" (the claimed "*probing signal*") which is sent by the SS in response to an RNG_RSP with status code "continue" received from the BS. In addition, as explained below, 802.16a's SS forms and transmits the ranging transmission with a code sequence modulated in the frequency domain. HONDA-1003, 72.

(i) "a transmitter configured to form and transmit, in response to the received request, the probing signal with a code sequence..."

As previously discussed, 802.16a specifies that the periodic CDMA "ranging transmissions" include "binary ranging codes" which are "subsequences of the **pseudo-noise sequence**" generated by a polynomial **generator** shown in Figure 128be. HONDA-1004, 8.5.7.3 (paragraphs 1-2); HONDA-1003, 73. This description of a "binary ranging code" in 802.16a is consistent with the '302 Patent's explanation that

"[e]ither **binary** or non binary sequences can be used" for the "DSSS sequence." HONDA-1001, 7:43-47; HONDA-1003, 73.

Furthermore, as explained with reference to claim feature [23.1](i), above, 802.16a describes "periodic ranging codes" as consisting of "periodic ranging **CDMA** codes." HONDA-1004, FIG. 59c, Table 122; HONDA-1003, 74. This is consistent with the '302 Patent which describes the **DSSS** (probing signal) as using "**spreading** codes" (HONDA-1001, 1:30-31) and the DSSS signal (probing signal) having a "**spreading** factor" (HONDA-1001, 6:6-7). HONDA-1003, 74. A POSITA would have understood that a "CDMA code" (as taught in 802.16a) is a "spreading code" that has a "spreading factor" (as described in the '302 Patent). HONDA-1003, 74 (citing Hall, HONDA-1009, as disclosing a system that provides "synchronous **direct-sequence** code division multiple access (DS-**CDMA**)" and in particular where the "modulation is direct-sequence spread-spectrum (**DS-SS**)").

802.16a further specifies that "[t]o effect a ranging transmission, each user randomly chooses one ranging code from a bank of specified binary codes." HONDA-1004, 8.5.7 (paragraph 1); HONDA-1003, 75. Specifically, an SS will "select, with equal probability, one of the codes of the appropriate subset, modulate it onto the Ranging Subchannel and subsequently **transmit**" the ranging code. HONDA-1004, 6.2.10.2 (paragraph 2); HONDA-1003, 75.

Therefore, 802.16a teaches that the SS is configured to form and transmit the

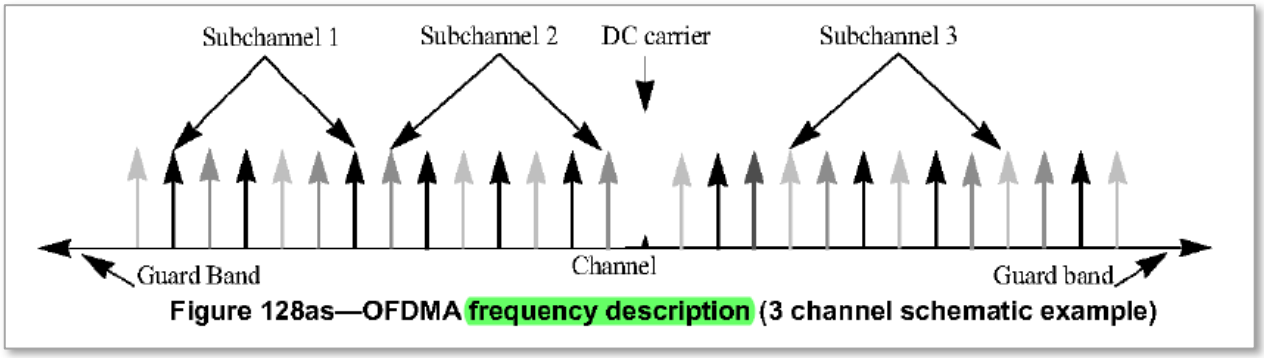
"ranging transmission" (the claimed "*probing signal*") with a "ranging code" consisting of a subsequence of the **pseudo-noise sequence** (the claimed "*code sequence*"). HONDA-1003, 76. Similarly, Koo teaches that the "ranging codes are created by segmenting a PN (**Pseudorandom Noise**) **sequence** … into predetermined units" and performs the "performs the period[ic] ranging process using the ranging codes." HONDA-1006, [0021], [0023]; HONDA-1003, 76. As a result, a POSITA would have understood that both 802.16a and Koo disclose "*a transmitter configured to form and transmit, in response to the received request, the probing signal with a code sequence…*" as recited in claim feature [23.2]. HONDA-1003, 76.

(ii) "…modulated in the frequency domain"

Furthermore, as explained in detail below, 802.16a teaches that bits of the binary ranging code are used to modulate carriers in the frequency domain. HONDA-1003, 77. In particular, 802.16a teaches that when the SS transmits the ranging code, the SS shall "**modulate** it onto the Ranging Subchannel and subsequently transmit in a with equal probability selected (pair of) OFDM symbol(s) within the appropriate UL allocation." HONDA-1004, 6.2.10.2 (paragraph 2); HONDA-1003, 77. To perform the modulation, 802.16a explains that the codes are "**BPSK modulated** onto the **carriers** in the ranging channel, one bit per carrier." HONDA-1004, 8.5.7 (paragraph 1); HONDA-1003, 77. Specifically, 802.16a discloses that the "length of each ranging code is 106 bits" and these "bits are used to **modulate** the **sub-carriers** in a pair of adjacent **subchannels**." HONDA-1004, 8.5.7.3 (paragraph 2); HONDA-1003, 77. In

more detail, 802.16a describes a particular formula for "BPSK modulation on the ranging transmissions" in which the "*k*th carrier of the Ranging Channel" is modulated by the "*k*th bit of the code bits of the ranging code sequence." HONDA-1004, 8.5.9.4.3.2; HONDA-1003, 77. Therefore, 802.16a discloses that a particular modulation scheme (BPSK, or Binary Phase Shift Keying) is used to modulate each bit of the ranging code onto a respective carrier in the ranging channel. HONDA-1003, 77.

Furthermore, 802.16a describes that the "carriers" are grouped into "subchannels" a part of the "**frequency domain** description" of OFDMA. HONDA-1004, 8.5.2.2, FIG. 128as (below, annotated); HONDA-1003, 78.



802.16a-2003, FIG. 128as (annotated)

Therefore, 802.16a teaches that the bits of the "ranging code" which is a "subsequence of the pseudo-noise sequence" (the claimed "*code sequence*") in the "ranging transmission" (the claimed "*probing signal*") are modulated onto "carriers" in the "ranging subchannel" (the claimed "*in the frequency domain*"). HONDA-1003, 79.

Moreover, 802.16a teaches that the SS implements a "transmitter" for transmitting uplink signals to the BS. HONDA-1003, 80. For example, 802.16a discloses "in

the UL, a transmitter may be assigned one or more subchannels, several transmitters may transmit in parallel." HONDA-1004, 8.5.2.2 (p. 180); HONDA-1003, 80. 802.16a also specifies various "transmitter requirements." HONDA-1004, 8.5.12; HONDA-1003, 80.

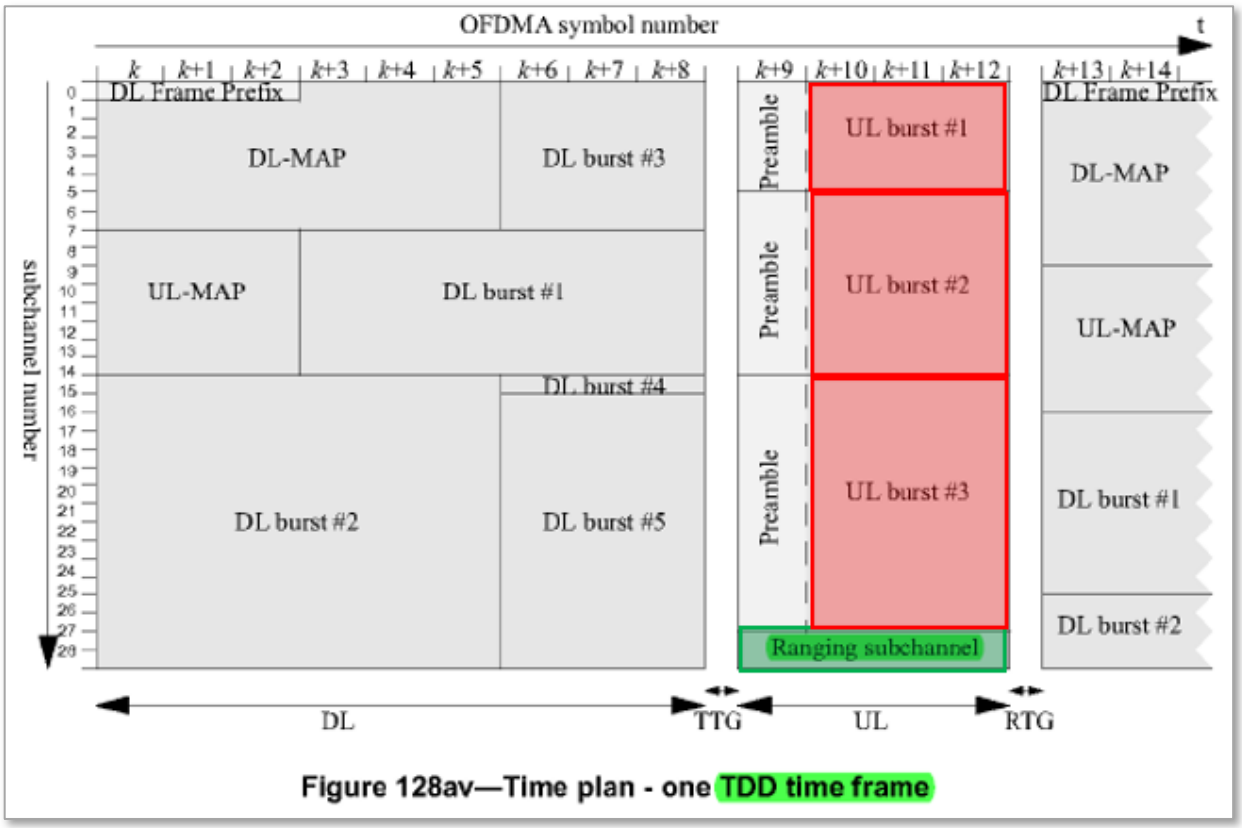
As a result, a POSITA would have understood that the combination of 802.16a and Koo discloses "*a transmitter configured to form and transmit, in response to the received request, the probing signal with a code sequence modulated in the frequency domain*" as recited in claim feature [23.2]. HONDA-1003, 81.

[23.3] "the probing signal is configured to overlap, in the time domain, with uplink signals transmitted over an uplink frequency band by other mobile devices in the system; and"

The combination of 802.16a and Koo discloses at least two different types of "*uplink signals transmitted by other mobile devices*" that overlap with a ranging transmission (the claimed "*probing signal*"). HONDA-1003, 82. As one example, 802.16a discloses that the ranging transmission overlaps with "payload of MAC PDUs" which are transmitted by other SSs. HONDA-1003, 82. As another example, the ranging transmission of 802.16 overlaps with ranging transmissions transmitted by other SSs, resulting in users colliding on the ranging channel. HONDA-1003, 82. Both of these examples are described in detail below.

As discussed above, 802.16a defines a "frame structure" in which the "ranging subchannel" and various "UL bursts" are allocated within an uplink ("UL") portion of

the frame. HONDA-1004, 8.5.4, FIG. 128av (below, annotated); HONDA-1003, 83.

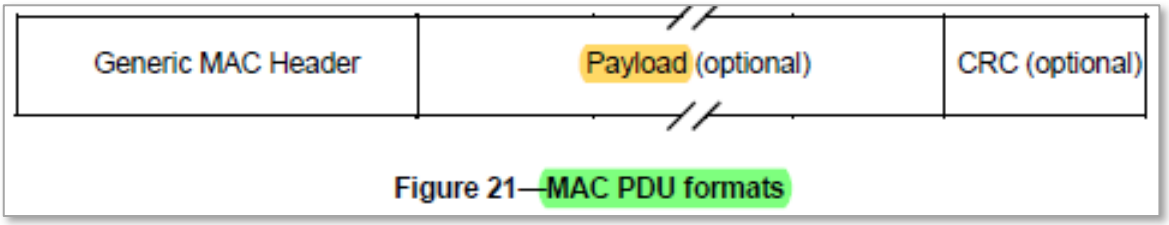


802.16a-2003, FIG. 128av (annotated)

As seen above, the "ranging subchannel" overlaps in the time domain with the "UL bursts" over OFDMA symbol numbers *k+10*, *k+11*, and *k+12*. HONDA-1003, 84. As evident from the horizontal axis of FIG. 128av marked "*t*", these OFDMA symbol numbers enumerate units of time in the time domain. *Id.* Also, as seen in FIG. 128av, in the frequency domain, the "UL bursts" are transmitted over an uplink frequency band, such as a frequency band that includes subchannel numbers 0 through 31 along the vertical axis in FIG. 128av. *Id.* Because this band of frequencies is used for uplink transmissions during the "UL" period, it is an uplink frequency band. *Id.* The fact that the same band of frequencies is sometimes used for downlink

transmissions (during the "DL" period) does not change the fact that it is used for uplink transmissions during the "UL periods." *Id*. As such, in 802.16a, the "UL bursts" are transmitted over a band of frequencies (e.g., a band of frequencies that includes subchannel numbers 0 through 31 in FIG. 128av) which is an uplink frequency band during the "UL" periods. *Id*.

Furthermore, each "UL burst" includes multiple "MAC PDUs" and each MAC PDU has a "MAC payload." HONDA-1005, 6.2.3.2 and FIG. 26, 6.2.2, FIG. 21 (below, annotated); HONDA-1003, 85.



802.16-2001, FIG. 21 (annotated)

Therefore, 802.16a discloses that the "ranging subchannel" overlaps in time with the "MAC payloads" that are transmitted in the "UL bursts." HONDA-1003, 86.

Furthermore, 802.16a discloses that the UL bursts can be allocated to different SSs. HONDA-1003, 87. For example, 802.16a discloses that a "PHY burst in OFDMA is allocated a group of contiguous subchannels" and "can be assigned in the UL to a specific SS." HONDA-1004, 8.5.3.1; HONDA-1003, 87. Moreover, "in the uplink, each subchannel may be transmitted from a different SS." HONDA-1004, 8.5.6; HONDA-1003, 87. Therefore, 802.16a discloses that different UL bursts (each consisting of subchannels) can be transmitted from different SSs. HONDA-1003, 87.

Therefore, the combination of 802.16a and Koo teaches that a user's "ranging transmission" (the claimed "*probing signal*") overlaps over a certain number of OFDMA symbols in time (the claimed "*overlap, in the time domain*") with "MAC payloads" in UL bursts that are transmitted by other SSs (the claimed "*uplink signals transmitted over an uplink frequency band by other mobile devices in the system*"). HONDA-1003, 88.

As another example, 802.16a also discloses that different SSs transmit "ranging transmissions" that collide (and therefore overlap in time) on the single ranging channel. HONDA-1003, 89. In particular, 802.16a teaches that for the Wireless MAN-OFDMA PHY implementations, "the MAC shall define a single ranging channel" and "[u]sers are allowed to collide on this ranging channel." HONDA-1004, 8.5.7 (paragraph 1); HONDA-1003, 89. When transmissions of these different ranging transmissions (which include different "ranging codes") by multiple users collide on the ranging channel, "the BS can separate colliding codes and extract timing (ranging) information and power" for a particular user, which is referred to as "the process of user code detection." HONDA-1004, 8.5.7.3 (paragraph 8); HONDA-1003, 89.

Therefore, the combination of 802.16a and Koo teaches that a user's "ranging transmission" (the claimed "*probing signal*") is configured to "collide" during the "period of one OFDM symbol" on the ranging channel (the claimed "*overlap, in the time domain*") with "colliding codes" in "ranging transmissions" that are transmitted by other users in the ranging subchannel (the claimed "*uplink signals transmitted over*

an uplink frequency band by other mobile devices in the system"). HONDA-1003, 90.

As a result, for the various reasons discussed above, a POSITA would have understood that the combination of 802.16a and Koo discloses "*the probing signal is configured to overlap, in the time domain, with uplink signals transmitted over an uplink frequency band by other mobile devices in the system*" as recited in claim feature [23.3]. HONDA-1003, 91.

[23.4] "the probing signal is configured to occupy a portion of spectrum in the uplink frequency band not designated for transmission of uplink control signals in the system."

As discussed above, 802.16a defines a "frame structure" in which **uplink** (UL) transmissions include "UL bursts" and a "ranging subchannel." HONDA-1004, FIG. 128av (below, annotated); HONDA-1003, 92.

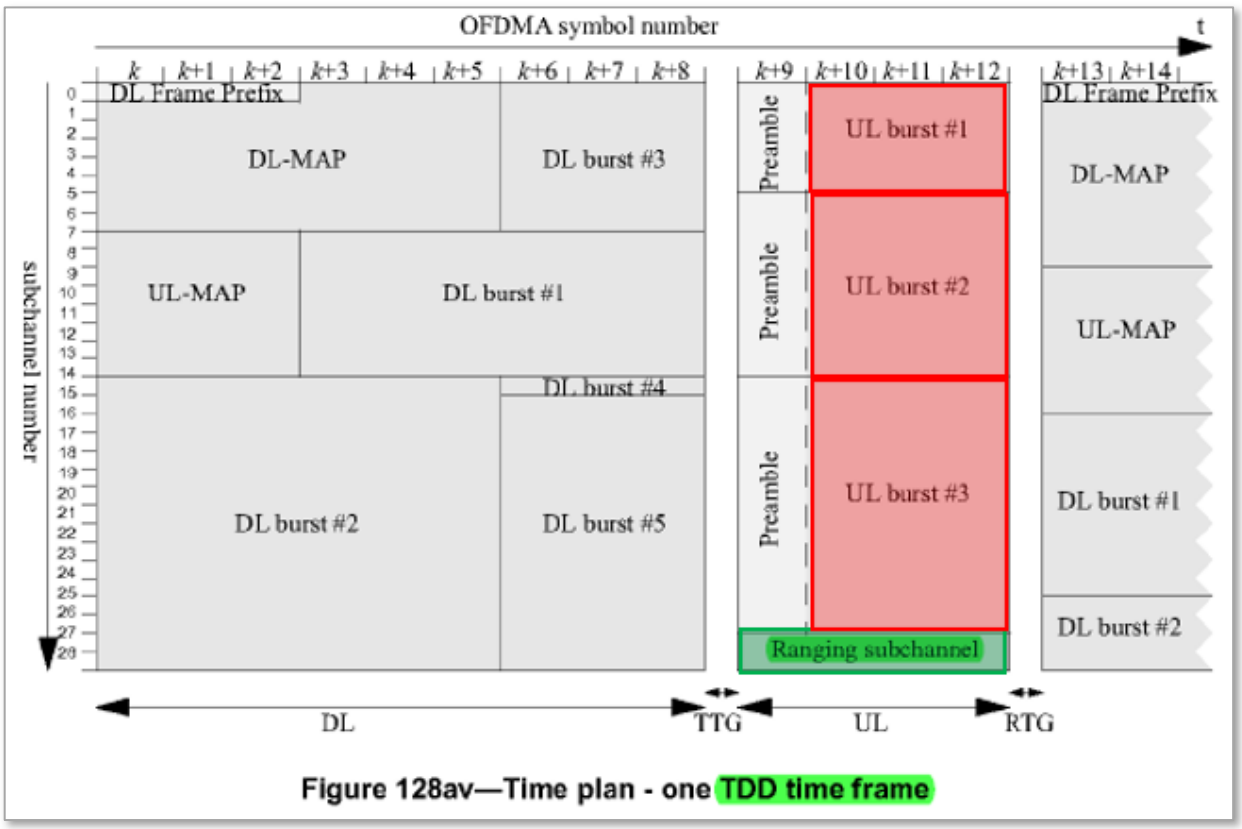


Figure 128av—Time plan - one TDD time frame

802.16a-2003, FIG. 128av (annotated)

As seen above, UL bursts are allocated in different frequency subchannels (along the vertical axis of FIG. 128av) which are distinct from the ranging subchannel. HONDA-1003, 93. Furthermore, as discussed above, 802.16a describes "subchannels" as a fundamental part of the "**frequency domain** description" of OFDMA. HONDA-1004, 8.5.2.2, FIG. 128as (below, annotated); HONDA-1003, 93.

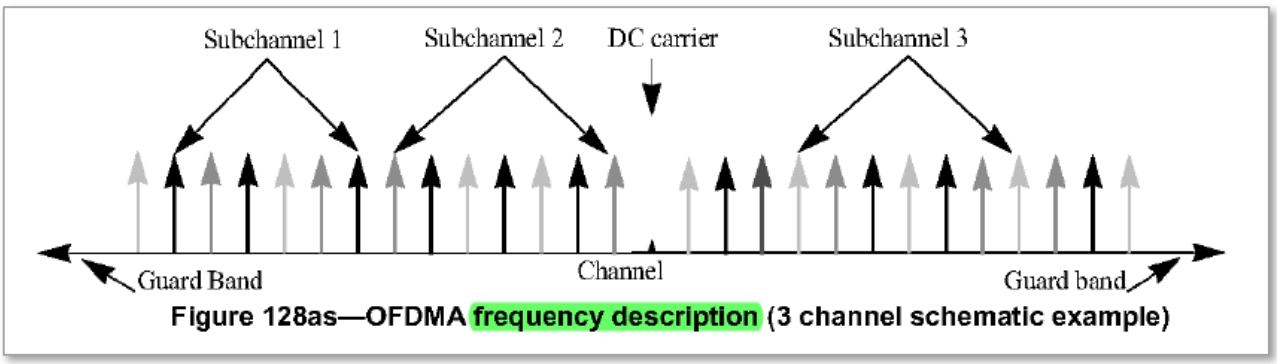


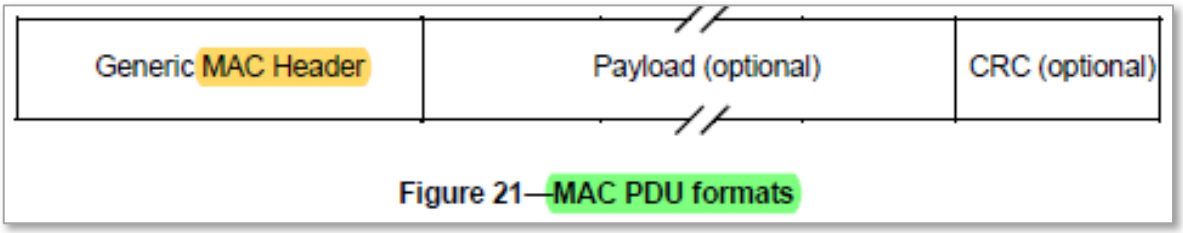
Figure 128as—OFDMA frequency description (3 channel schematic example)

802.16a-2003, FIG. 128as (annotated)

Therefore, a POSITA would have understood that the "ranging transmission" of 802.16a occupies a portion of spectrum in the uplink frequency band (e.g., in FIG. 128av, the ranging transmission occupies the "ranging subchannel" in the last two frequency subchannels of the uplink frequency band from subchannel numbers 0 through 31) which is not designated for transmission of the UL bursts. HONDA-1003, 94.

This is further confirmed by 802.16a disclosing a technique for "UL transmission allocations" which involve "the **allocation** of **ranging subchannels** within the OFDMA symbols, while the **rest of the subchannels** are used for **users transmission**." HONDA-1004, 8.5.4.6; HONDA-1003, 95. Therefore, 802.16a clearly distinguishes the (frequency-domain) subchannel allocation of "ranging subchannels" which is distinct from the "rest of the subchannels" that are allocated for user transmissions. HONDA-1003, 95. Accordingly, a POSITA would have understood that the "ranging transmission" of 802.16a occupies a portion of spectrum in the uplink frequency band not designated for transmission of the "UL bursts." HONDA-1003, 95.

In addition, a POSITA would have understood that the UL bursts of 802.16a include **uplink control** signals. HONDA-1003, 96. For example, as discussed in regard to claim feature [23.3], above, each UL burst includes multiple "MAC PDUs." HONDA-1005, 6.2.3.2, FIG. 26; HONDA-1003, 96. Further, 802.16a specifies that each MAC PDU has a "**MAC header**." HONDA-1005, 6.2.2, FIG. 21 (below, annotated); HONDA-1003, 96.



802.16-2001, FIG. 21 (annotated)

The MAC header can be a "Generic MAC Header" (which can include a "MAC management message" or "CS data") or the MAC header can be a "Bandwidth Request Header used to request additional bandwidth." HONDA-1005, 6.2.2; HONDA-1003, 97. In each case, a POSITA would have understood that the "MAC header" includes numerous fields with parameters, identifiers, and descriptors that convey control information about the uplink MAC PDU transmitted in the UL burst. HONDA-1005, Tables 3 and 6; HONDA-1003, 97. For example, the "Generic MAC header" includes a field "CI" which is a 1-bit indicator of whether CRC is appended to the MAC PDU, and a field "CID" which is a 16-bit connection identifier, and a field "EC" which is a 1-bit "Encryption Control" flag indicating whether the payload of the uplink MAC PDU is encrypted. HONDA-1005, Table 3 (below, annotated); HONDA-1003, 97.

Table 3—Generic MAC header fields

Name	Length (bits)	Description
CI	1	CRC Indicator 1 = CRC is appended to the PDU 0 = No CRC is appended
CID	16	Connection Identifier
EC	1	Encryption Control 0 = Payload is not encrypted 1 = Payload is encrypted
EKS	2	Encryption Key Sequence The index of the Traffic Encryption Key and Initialization Vector used to encrypt the payload. This field is only meaningful if the Encryption Control field is set to 1.
HCS	8	Header Check Sequence An 8-bit field used to detect errors in the header. The generator polynomial is $g(D)=D^8+D^2+D+1$.
HT	1	Header Type. Shall be set to zero.
LEN	11	Length The length in bytes of the MAC PDU including the MAC header.
Type	6	This field indicates the payload type, including presence of subheaders.

802.16-2001, Table 3 (annotated)

Therefore, because the MAC header of the uplink MAC PDU includes various flags, identifiers, and indicators that control or identify features regarding the uplink transmission of the MAC PDU (such as encryption and CRC of the MAC PDU) in the uplink UL burst, a POSITA would have understood that these various fields of the MAC header convey uplink control information. HONDA-1003, 98. Therefore, a POSITA would have understood that the "MAC header" which includes uplink control information regarding the uplink "MAC PDU" which is transmitted in the "UL burst" of 802.16a is an "uplink control signal." HONDA-1003, 98.

Therefore, at least because of the reasons discussed above, 802.16a teaches the "ranging transmission" (the claimed "*probing signal*") is configured to occupy the

"ranging subchannel" (the claimed "*a portion of spectrum in the uplink frequency band*") which is not designated for transmission of the "MAC headers" which include various uplink control information (the claimed "*transmission of uplink control signals in the system*"). HONDA-1003, 99.

As a result, a POSITA would have understood that the combination of 802.16a and Koo discloses "*the probing signal is configured to occupy a portion of spectrum in the uplink frequency band not designated for transmission of uplink control signals in the system*" as recited in claim feature [23.4]. HONDA-1003, 100.

6. Claims 24, 26, and 27 are obvious over 802.16a in view of Koo

Claim 24

[24.0] "The mobile device of claim 23, wherein the probing signal provides information for the base station to estimate a channel profile in the frequency domain."

As discussed above, when the base station in 802.16a receives a ranging transmission from the SS, the BS performs a process of "code detection" in which the BS detects the "ranging code" of the user and obtains a "**Channel Impulse Response** (CIR)" to acquire information about "the user **channel** and **condition**." HONDA-1004, 8.5.7.3; HONDA-1003, 101. Furthermore, a POSITA would have understood that the base station uses the "Channel Impulse Response (CIR)" of 802.16a to estimate a channel profile in the frequency-domain. HONDA-1003, 101. For example, 802.16a discloses a "Fourier transform" representation of "channel impulse responses."

HONDA-1004, 8.3.3.1.2; HONDA-1003, 101. Although this particular description in 802.16a is in the context of the single-carrier ("SCa") implementation, a POSITA would have understood that, in general, it was fundamentally well-known that a "Fourier transform" is an extremely common frequency-domain representation of a time-domain sequence (in this case, the time-domain sequence of a "channel impulse response"). HONDA-1003, 101.

As the Buehrer Declaration explains, it was well-known prior to the Critical Date that a receiver in an OFDM wireless system can estimate the frequency response of a channel by using a Fourier transform of the channel impulse response. HONDA-1003, 102 (citing Terry, HONDA-1013, as disclosing "[c]hannel estimation is the task of estimating the frequency response of the radio channel" where the "frequency response of the channel is the Fourier transform of the channel impulse response" and "the channel estimation process outputs … an estimate of the channel frequency response for each subcarrier").

Furthermore, this description in 802.16a (and the corroboration in the Buehrer Declaration) of a base station obtaining a "channel impulse response" from which the base station obtains a frequency-domain channel response is consistent with the '302 Patent's description that "by estimating the peaks of a channel response in the time domain … the channel profile in the frequency domain … can be obtained." HONDA-1001, 9:18-26; HONDA-1003, 103.

Therefore, because 802.16a discloses the "ranging transmission" (the claimed

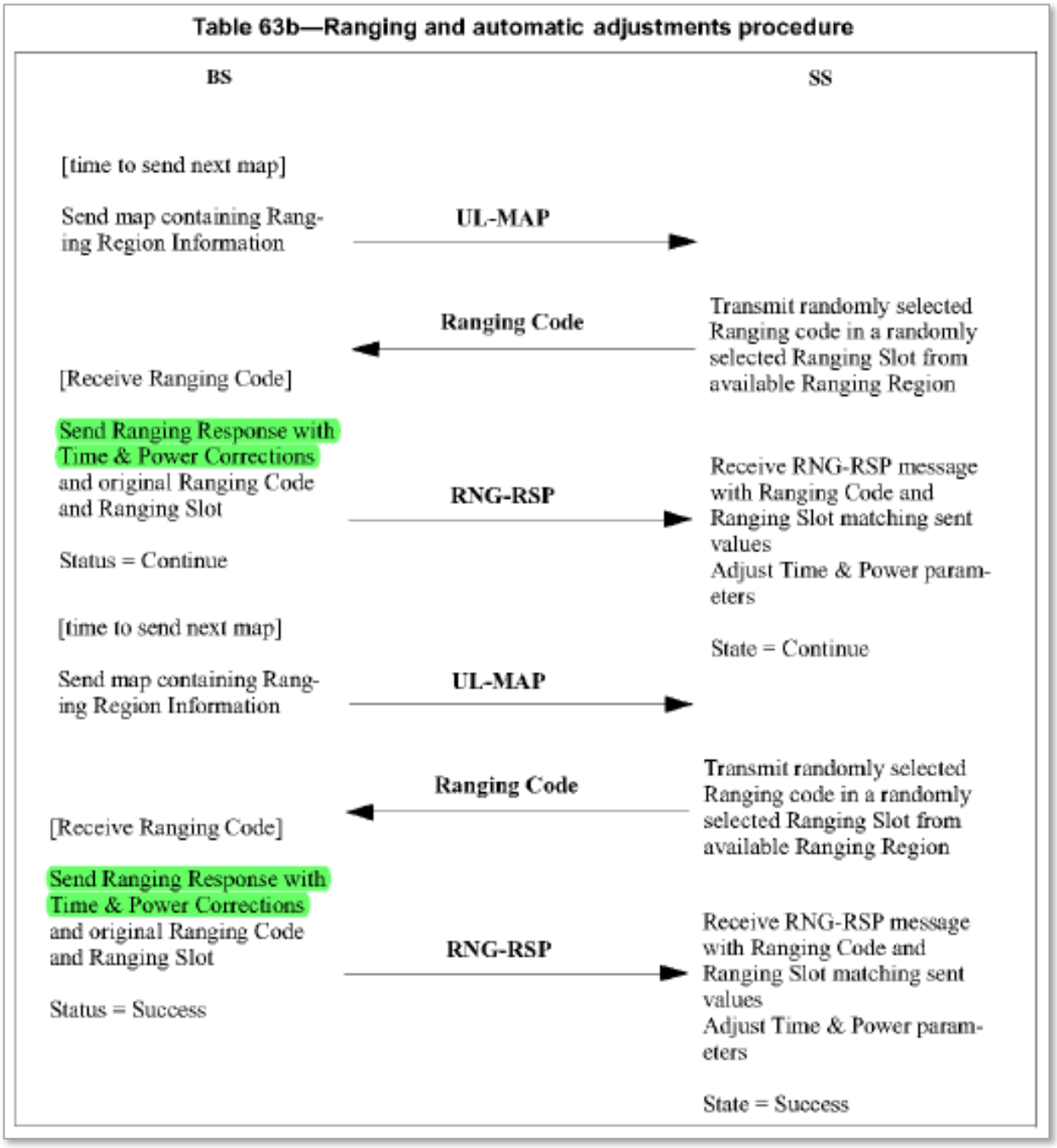
"*probing signal*") provides a "channel impulse response" (the claimed "*information*") which the base station uses to estimate the channel frequency response (the claimed "*channel profile in the frequency domain*"), a POSITA would have understood that the combination of 802.16a and Koo discloses "*the probing signal provides information for the base station to estimate a channel profile in the frequency domain*" as recited in claim 24. HONDA-1003, 104.

Claim 26

[26.0] "The mobile device of claim 23, wherein the probing signal provides information for the base station to determine a transmission format for a subsequent transmission."

As discussed above, 802.16a discloses that a periodic CDMA "ranging transmission" (the claimed "*probing signal*") by the SS allows the BS to acquire information "about the user channel and condition." HONDA-1004, 8.5.7.3, p. 203; HONDA-1003, 105. By acquiring this information, the "time (ranging) and power measurements allow the system to compensate for the near/far user problems and the propagation delay." *Id*. In particular, the "time and power parameters" are "monitored, measured, and stored **at the base station**, and transmitted to the subscriber unit." HONDA-1004, 8.5.10.2; HONDA-1003, 105. Thus, at the base station, "the stored parameters are updated in a periodic manner based on configurable update intervals to ensure changes in the channel can be accommodated." *Id*. This enables the BS "to adjust transmission parameters so the SSs can communicate with the BS properly." HONDA-1004, 6.2.10, p. 80; HONDA-1003, 105.

In particular, after updating the stored transmission parameters, the BS transmits the adjusted transmission parameters to the SS through the "RNG-RSP" and thereby sends the "Ranging Response with Time & Power Corrections." HONDA-1004, Table 63b (below, annotated); HONDA-1003, 106. At the SS, the adjusted parameters in the received RNG-RSP allows the SS to "adjust local parameters per RNG-RSP." HONDA-1004, FIG. 59c (below, annotated); HONDA-1003, 106.



802.16a-2003, Table 63b (annotated)

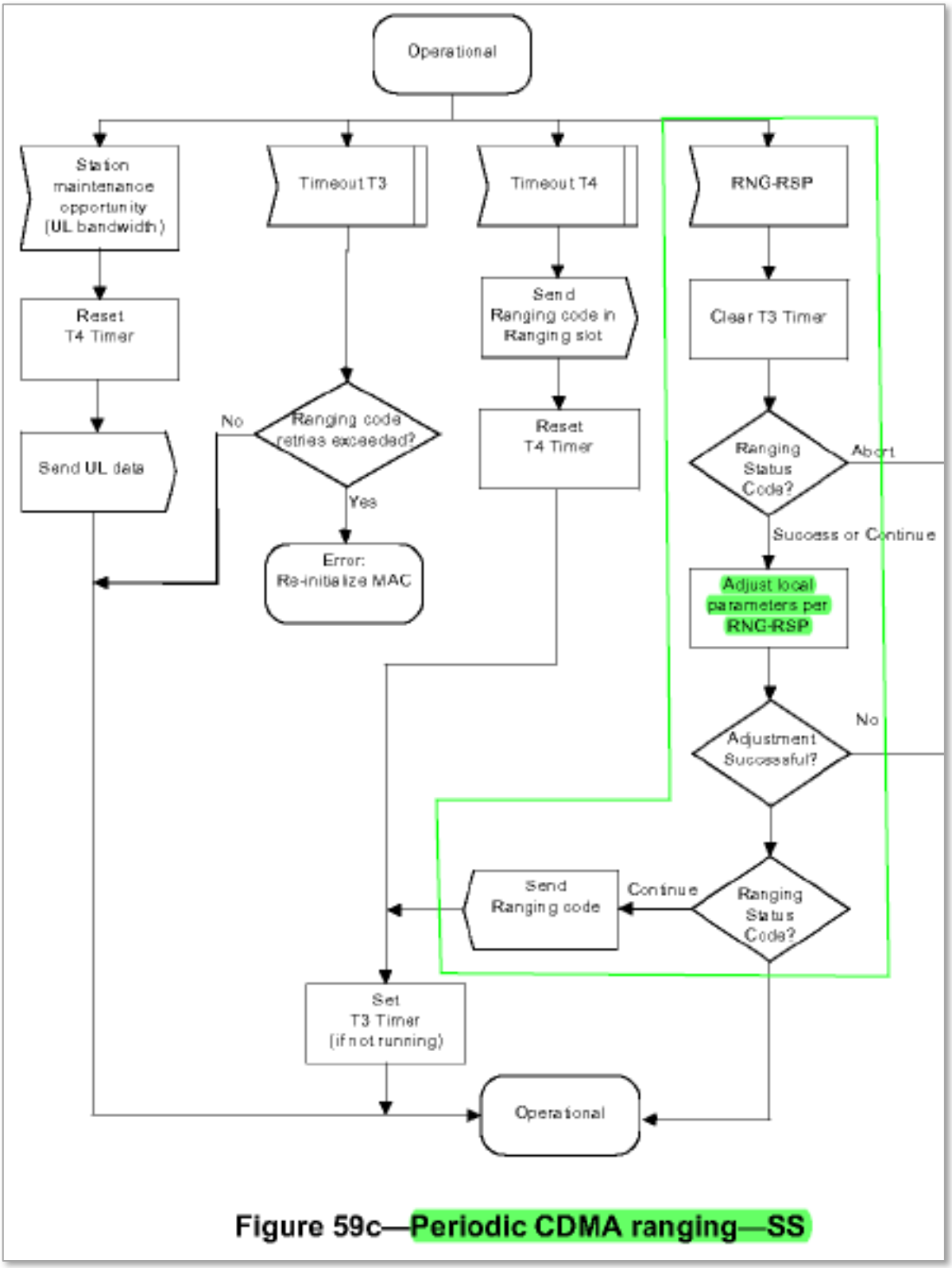


Figure 59c—Periodic CDMA ranging—SS

802.16a-2003, FIG. 59c (annotated)

Therefore, as seen above, the BS monitors, measures, and stores the SS's

transmission parameters, updates the parameters periodically based on the periodic CDMA ranging transmissions received from the SS, and transmits the adjusted transmission parameters to the SS through the "RNG-RSP" message, which allows the SS to adjust its local parameters. HONDA-1003, 107. 802.16a explains that the "Ranging Response message contains all the needed adjustment (e.g., time, power and possibly frequency corrections)." HONDA-1004, 6.2.10.2 (4th paragraph); HONDA-1003, 107.

This periodic adjustment of the SS's transmission parameters by the BS enables the uplink to "support different modulation schemes for each SS based on the MAC burst configuration messages coming from the Base Station." HONDA-1004, 8.5.9.4.1; HONDA-1003, 108. In particular, 802.16a provides various examples of different modulation schemes that are based on constellation mappings of "Gray-mapped QPSK," "16-QAM," and "64-QAM." HONDA-1004, 8.5.9.4.1 (1st paragraph); HONDA-1003, 108. As the Buehrer Declaration explains, a POSITA would have understood that the fundamental difference between these supported modulation schemes is that they trade bandwidth efficiency for energy efficiency. HONDA-1003, 108. Specifically going from QPSK to 16-QAM to 64-QAM allows for higher data rates to be supported, but at the cost of higher power requirements. *Id*. Thus, a POSITA would understand that as part of performing adaptive modulation, some measurement of received signal power is needed. *Id*.

Furthermore, 802.16a explains that the constellation is "normalized by

multiplying the constellation point with the indicated factor *c* to achieve equal average power." *Id*. As such, a POSITA would have understood that the modulation scheme of 802.16a can be adapted (e.g., the constellation and average power of the modulation constellation can be adjusted) based on adjustments of transmission power that the BS determines based on the received CDMA ranging code. HONDA-1003, 108. In general, this process of "adaptive modulation" enables a system to "**subsequently communicate** with multiple systems using different burst profiles." HONDA-1004, p. 4 (definition 3.57); HONDA-1003, 108.

Therefore, 802.16a discloses that the periodic CDMA ranging transmission (the claimed "*probing signal*") provides the BS with information such as a "channel impulse response (CIR)" and "information about the user channel and condition" (the claimed "*information*") so that the BS can monitor, measure, store, and update the SS's transmission parameters and adaptively determine a "modulation scheme" (the claimed "*for the base station to determine a transmission format*") for a subsequent transmission. HONDA-1003, 109.

Accordingly, for at least the reasons discussed above, a POSITA would have found obvious that the combination of 802.16a and Koo discloses "*the probing signal provides information for the base station to determine a transmission format for a subsequent transmission*" as recited in claim 26. HONDA-1003, 110.

Claim 27

[27.0] "The mobile device of claim 26, wherein the transmission format comprises a modulation/coding or pilot pattern."

As discussed in regard to claim 26, above, 802.16a discloses that the CDMA ranging transmission (the claimed "*probing signal*") enables the base station to adaptively determine a "modulation scheme" (the claimed "*transmission format*") for a subsequent transmission. HONDA-1003, 111. For example, as discussed above, 802.16a provides various examples of different modulation schemes that are based on constellation mappings of "Gray-mapped QPSK," "16-QAM," and "64-QAM." HONDA-1004, 8.5.9.4.1 (1st paragraph); HONDA-1003, 111.

Furthermore, as discussed above, based on channel information acquired from the periodic ranging transmissions, the base station is able to periodically update the SS's "time and power parameters" and inform the SS of the updated parameters to "ensure changes in the channel can be accommodated." HONDA-1004, 8.5.10.2; HONDA-1003, 112. This enables the BS "to adjust transmission parameters so the SSs can communicate with the BS properly." HONDA-1004, 6.2.10, p. 80; HONDA-1003, 112.

As such, a POSITA would have understood that the modulation scheme of 802.16a can be adapted (e.g., the timing and power of the modulation constellation can be adjusted) based on adjustments of transmission parameters that the BS determines from the received CDMA ranging transmission. HONDA-1003, 113. In addition,

802.16a describes "modulation" and the adaptive use of "different modulation schemes" as part of the overall process of "channel coding." HONDA-1004, 8.5.9 (heading), 8.5.9.4 (heading), 8.5.9.4.1 (2nd paragraph); HONDA-1003, 113.

Therefore, a POSITA would have understood that the combination of 802.16a and Koo disclose "*the transmission format comprises a **modulation/coding** or pilot pattern*." HONDA-1003, 114.

B. GROUND 2 – 802.16a and Kitroser Render Obvious Claims 23, 24, 26, and 27

As mentioned in Ground 1, above, 802.16a discloses all features of the Challenged Claims except for a device that is "mobile." HONDA-1003, 115. However, a POSITA would have understood that the relevant teachings of 802.16a (e.g., as relating to the "ranging process") are directly applicable to a "mobile environment" as taught by Kitroser. HONDA-1003, 115.

Moreover, because Kitroser predates even the earlier filing date of the '302 First Provisional, Kitroser shows that a POSITA would have known the applicability of the 802.16a "ranging process" to a "mobile environment" even as far back as the filing date of the '302 First Provisional. HONDA-1003, 116.

1. Kitroser Overview

Kitroser shows that a POSITA would have known, even prior to the '302 First Provisional filing date, that the teachings of 802.16a relating to the "ranging process" were directly applicable to mobile environments. HONDA-1003, 117.

Kitroser is directed to "IEEE 802.16e Mobility System Perspective." HONDA-1007, title. Kitroser explains "[t]his contribution presents some notes on reference system deployment scenario and impact of the mobile environment on the current 802.16a, and answers some of the points presented in the call for contributions IEEE 80216e-02_01." HONDA-1007, p. 1 (Abstract); p. 2 (§ 1).

In particular, Kitroser discusses the "impact of the mobile environment on the current 802.16a" standard. HONDA-1007, p. 1 (§ 1), p. 3 (§ 3). In discussing the impact of a mobile environment on the existing IEEE 802.16a standard, Kitroser makes the unequivocal statement that for the "Ranging" process, "[n]o changes are required in the PHY layer ranging mechanism." HONDA-1007, p. 3 (§ 3); HONDA-1003, 119. As such, Kitroser clearly discloses that the PHY layer ranging mechanism of the existing IEEE 802.16a standard (for fixed wireless devices) would remain unchanged in a mobile environment. HONDA-1003, 119.

2. The Combination of 802.16a and Kitroser

As mentioned above, 802.16a is directed to "fixed broadband wireless access systems" in which subscriber stations are stationary. HONDA-1004, p. 3. Nonetheless, a POSITA would have known, even prior to the '302 First Provisional filing date, that the periodic CDMA ranging process described in 802.16a could also be used in a "mobile environment," as taught by Kitroser. HONDA-1003, 120.

As discussed above, Kitroser was a contribution to the IEEE 802.16 Broadband

Wireless Access Working Group which was tasked with developing the IEEE 802.16e standard for mobile wireless broadband communication. HONDA-1007, p. 1; HONDA-1003, 121. Kitroser discusses the "impact of the mobile environment on the current 802.16a" standard and therefore specifically contemplated modification of 802.16a to mobile environments. HONDA-1007, p. 1 (§ 1), p. 3 (§ 3); HONDA-1003, 121. Specifically, for the "Ranging" process of 802.16a, Kitroser unequivocally states that "[n]o changes are required in the PHY layer ranging mechanism" of 802.16a. HONDA-1007, p. 3 (§ 3); HONDA-1003, 121. As such, Kitroser clearly shows a POSITA would have known, even prior to the '302 First Provisional filing date, that the teachings of 802.16a relating to the "ranging process" were directly applicable to a mobile environment. HONDA-1003, 121.

As explained in the Buehrer Declaration, even before the '302 First Provisional filing date of January 2004, there was extensive discussion on how to modify the IEEE 802.16a standard to mobile environments (as evidenced by the IEEE 802.16 Broadband Wireless Access Working Group which began work in early 2003, for which Kitroser was one of many contributions). HONDA-1003, 122. For example, the Buehrer Declaration further cites Leiba (HONDA-1008) as another contribution to the same IEEE 802.16 Broadband Wireless Access Working Group. HONDA-1003, 122. The Buehrer Declaration explains that, like Kitroser, Leiba studied "802.16a OFDMA PHY suitability for mobile applications" prior to the '302 First Provisional filing date, and specifically described "[i]n a mobile environment ranging has to be

more frequent because of the existence of fast fading effects in the channel" and that the existing IEEE 802.16a standard could accommodate these changes (e.g., "OFDMA PHY can support the fast power control loop necessary in a mobile environment"). HONDA-1003, 122.

As a result, in view of the teachings of Kitroser and the general knowledge of a POSITA as described in the Buehrer Declaration, a POSITA would have understood even before the '302 First Provisional filing date that the "periodic CDMA ranging" process described in 802.16a would have been directly applicable to **mobile** devices. HONDA-1003, 123.

3. Claim 23 is obvious over 802.16a in view of Kitroser

Claim 23

[23.P] "A mobile device in an Orthogonal Frequency Division Multiplexing (OFDM) communication system, the mobile device comprising:"

To the extent the preamble is deemed limiting, the combination of 802.16a and Kitroser renders it obvious. HONDA-1003, 124. As previously discussed, the combination of 802.16a and Kitroser teaches that an SS operating in an OFDM communication system that can be implemented in a "mobile environment." HONDA-1003, 124.

Thus, the combination of 802.16a and Kitroser teaches "*a mobile device in an Orthogonal Frequency Division Multiplexing (OFDM) communication system*." HONDA-1003, 125.

[23.1] "a receiver configured to receive a request for a probing signal from a base station in the system;"

As discussed in Ground 1, above, for claim feature [23.1], 802.16a discloses that an SS includes a receiver configured to receive an "RNG-RSP message" with the special status code of "Continue" (the claimed "*request*") which initiates the SS to send a "ranging code" in a "ranging transmission" (the claimed "*probing signal*"). HONDA-1003, 126.

For at least this reason, the combination of 802.16a and Kitroser teaches "*a receiver configured to receive a request for a probing signal from a base station in the system*" as recited in claim feature [23.1]. HONDA-1003, 127.

[23.2] "a transmitter configured to form and transmit, in response to the received request, the probing signal with a code sequence modulated in the frequency domain, wherein:"

As discussed in Ground 1, above, for claim feature [23.2], 802.16a teaches that **(i)** the SS transmits the "ranging transmission" (the claimed "*probing signal*") with a "ranging code" that is a "subsequence of the pseudo-noise sequence" (the claimed "*code sequence*"), and that **(ii)** the bits of this code sequence are modulated onto "carriers" in the "ranging subchannel" (the claimed "*in the frequency domain*"). HONDA-1003, 128.

For at least this reason, a POSITA would have understood that the combination of 802.16a and Kitroser discloses "*a transmitter configured to form and transmit, in response to the received request, the probing signal with a code sequence modulated in*

the frequency domain" as recited in claim feature [23.2]. HONDA-1003, 129.

[23.3] "the probing signal is configured to overlap, in the time domain, with uplink signals transmitted over an uplink frequency band by other mobile devices in the system; and"

As discussed in Ground 1, above, for claim feature [23.3], 802.16a discloses at least two different types of "uplink signals" transmitted by other SSs that overlap with a ranging transmission. HONDA-1003, 130.

As one example, discussed above, 802.16a teaches that a user's "ranging transmission" (the claimed "*probing signal*") overlaps over a certain number of OFDMA symbols in time (the claimed "*overlap, in the time domain*") with "MAC payloads" in UL bursts that are transmitted by other SSs over a band of frequency subchannels used for uplink transmission (the claimed "*uplink signals transmitted over an uplink frequency band by other mobile devices in the system*"). HONDA-1003, 131.

As another example, discussed above, 802.16a teaches that a user's "ranging transmission" (the claimed "*probing signal*") is configured to "collide" during the "period of one OFDM symbol" on the ranging channel (the claimed "*overlap, in the time domain*") with "colliding codes" of ranging transmissions that are transmitted by other users over the ranging subchannel (the claimed "*uplink signals transmitted over an uplink frequency band by other mobile devices in the system*"). HONDA-1003, 132.

For at least these reasons, a POSITA would have understood that the

combination of 802.16a and Kitroser discloses "*the probing signal is configured to overlap, in the time domain, with uplink signals transmitted over an uplink frequency band by other mobile devices in the system*" as recited in claim feature [23.3]. HONDA-1003, 133.

[23.4] "the probing signal is configured to occupy a portion of spectrum in the uplink frequency band not designated for transmission of uplink control signals in the system."

As discussed in Ground 1, above, for claim feature [23.4], 802.16a teaches the "ranging transmission" (the claimed "*probing signal*") is configured to occupy the "ranging subchannel" (the claimed "*a portion of spectrum in the uplink frequency band*") which is not designated for transmission of the "MAC headers" which include various control information (the claimed "*transmission of uplink control signals in the system*"). HONDA-1003, 134

For at least this reason, a POSITA would have understood that the combination of 802.16a and Kitroser discloses "*the probing signal is configured to occupy a portion of spectrum in the uplink frequency band not designated for transmission of uplink control signals in the system*" as recited in claim feature [23.4]. HONDA-1003, 135.

4. Claims 24, 26, and 27 are obvious over 802.16a in view of Kitroser

Claim 24

[24.0] "The mobile device of claim 23, wherein the probing signal provides information for the base station to estimate a channel profile in the frequency domain."

As discussed in Ground 1, above, for claim 24, the "ranging transmission" of 802.16a (the claimed "*probing signal*") provides a "channel impulse response" (the claimed "*information*") for the base station to estimate a Fourier transform representation of the channel response (the claimed "*channel profile in the frequency domain*"). HONDA-1003, 136.

For at least these reasons, a POSITA would have understood that the combination of 802.16a and Kitroser discloses "*the probing signal provides information for the base station to estimate a channel profile in the frequency domain*" as recited in claim 24. HONDA-1003, 137.

Claim 26

[26.0] "The mobile device of claim 23, wherein the probing signal provides information for the base station to determine a transmission format for a subsequent transmission."

As discussed in Ground 1, above, for claim 26, the ranging transmission of 802.16a (the claimed "*probing signal*") provides the BS with information such as a "channel impulse response (CIR)" and "information about the user channel and condition" (the claimed "*information*") so that the BS can monitor, measure, store, and update the SS's transmission parameters and adaptively determine a "modulation scheme" (the claimed "*for the base station to determine a transmission format*") for a subsequent transmission. HONDA-1003, 138.

Therefore, a POSITA would have found obvious that the combination of 802.16a and Kitroser discloses "*the probing signal provides information for the base*

station to determine a transmission format for a subsequent transmission" as recited in claim 26. HONDA-1003, 139.

Claim 27

[27.0] "The mobile device of claim 26, wherein the transmission format comprises a modulation/coding or pilot pattern."

As discussed in Ground 1, above, for claim 27, and also as discussed in regard to claim 26, above, the CDMA ranging transmission of 802.16a (the claimed "*probing signal*") enables the base station to adaptively determine at least a transmission power and a "modulation scheme" (the claimed "*transmission format*") for a subsequent transmission. In addition, 802.16a describes "modulation" and the adaptive use of "different modulation schemes" as part of the overall process of "channel coding." HONDA-1004, 8.5.9 (heading), 8.5.9.4 (heading), 8.5.9.4.1 (2nd paragraph); HONDA-1003, 140.

For at least these reasons, a POSITA would have understood that the combination of 802.16a and Kitroser discloses "*the transmission format comprises a* ***modulation/coding*** *or pilot pattern*." HONDA-1003, 141.

IV. PTAB DISCRETION SHOULD NOT PRECLUDE INSTITUTION

A. *Fintiv* strongly favors institution.

If Patent Owner seeks 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* HONDA-1017 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). HONDA-1016.

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 '302 patent. Nor has Petitioner used the Volkswagen IPR as a "roadmap" to craft invalidity positions. Rather, Petitioner's review and consideration of the record in Volkswagen IPR is no different than review of the '302 patent's file history—routine diligence to understand the patent's history before the Office.

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, non-cumulative prior art asserted in the Petition" Petition for *Inter Partes* Review of USP 10,771,302 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).

V. CONCLUSION AND FEES

The Challenged Claims are unpatentable. Petitioner authorizes charge of fees to Deposit Account 06-1050.

VI. MANDATORY NOTICES UNDER 37 C.F.R § 42.8(a)(1)

A. Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1)

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

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

The '302 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*, 3-22-cv-01252 (N.D. Ohio), filed July 15, 2022; *Neo Wireless, LLC v. Mercedes-Benz USA*, LLC, 3-22-cv-00780 (M.D. Fla.), filed

July 15, 2022.

The '302 patent is also the subject of an IPR2022-01538 filed by Volkswagen Group of America. The petition was filed on September 15, 2022.

C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel.

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D. Service Information

Please address all correspondence and service to the address listed above. Petitioner consents to electronic service by email at IPR15625-0037IP4@fr.com (referencing No. 15625-0037IP4 and cc'ing PTABInbound@fr.com).

Respectfully submitted,

Dated March 30, 2023

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(Control No. IPR2023-00797)

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 12,568 words, which is less than the 14,000 allowed under 37 CFR § 42.24.

Dated March 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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