UNITED STATES PATENT AND TRADEMARK OFFICE

_____

BEFORE THE PATENT TRIAL AND APPEAL BOARD

_____

T-MOBILE USA, INC., AT&T SERVICES, INC., CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS, ERICSSON INC. AND NOKIA OF AMERICA CORPORATION

Petitioners,

v.

HEADWATER PARTNERS II LLC

Patent Owner.

_____

Case No. IPR2024-_____

U.S. Patent No. 9,094,868

_____

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 9,094,868

UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *ET SEQ*.

TABLE OF CONTENTS

I. INTRODUCTION 1
II. GROUNDS FOR STANDING (37 C.F.R. § 42.104(A)) 2
III. IDENTIFICATION OF CHALLENGE (37 C.F.R. § 42.104(B)) AND RELIEF REQUESTED (37 C.F.R. § 42.22(A)) 2
A. IDENTIFICATION OF PRIOR ART 2
B. STATUTORY GROUNDS UPON WHICH THE CHALLENGE IS BASED 2
C. REQUESTED RELIEF 3
IV. OVERVIEW OF THE '868 PATENT 3
A. SPECIFICATION 3
B. PROSECUTION HISTORY 7
C. PRIORITY DATE 8
D. CHALLENGED CLAIMS 9
V. LEVEL OF ORDINARY SKILL IN THE ART 10
VI. CLAIM CONSTRUCTION (37 C.F.R. § 42.104(B)(3)) 10
VII. OVERVIEW OF THE PRIOR ART 11
A. JARVINEN 11
B. FOX 15
VIII. GROUNDS OF UNPATENTABILITY 17
A. GROUND 1: CLAIMS 1-34 ARE RENDERED OBVIOUS BY JARVINEN AND FOX AND FURTHER IN VIEW OF A POSITA 17
1. 1[pre] A method, comprising 24[pre] A method, comprising 34[pre] A method, comprising 18
2. 33[pre] A user equipment (UE), the UE comprising: a transceiver operative to communicate with a link partner device through a communication link, wherein the communication link includes a link quality; a controller, the controller operative to: 18
3. 1[a] / 24[a] / 33[a] determining a plurality of link qualities (LQs) of a user equipment (UE) for a plurality of positionings

of the UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of the UE 34[a] determining a plurality of link qualities (LQs) of one or more user equipment (UE) for a plurality of positionings of the one or more UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of a first UE of the one or more UE 21

4. 1[b] / 24[b] / 34[b] storing information associated with the plurality of LQs for the plurality of positionings 33[b] store information associated with the plurality of LQs for the plurality of positionings 26
5. 1[c] / 33[c] estimating at least one future positioning of the UE 34[c] estimating at least one future positioning of a second UE ..27
6. 24[c] estimating at least a positioning of the UE; determining at least one neighboring positioning of the positioning of the UE..... 29
7. 1[d] estimating a future link quality (LQ) of the UE at the at least one future positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE 24[d] estimating one or more neighboring link qualities (LQs) of the UE at the at least one neighboring positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE. 33[d] estimate a future link quality (LQ) of the UE at the at least one future positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE 34[d] estimating a future link quality (LQ) of the second UE at the at least one future positioning of the second UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the one or more UE 32
8. Limitations 1[d], 24[d], 33[d] and 34[d]: Obvious by Jarvinen in View of Fox Under 35 U.S.C. § 103 37
9. Limitations 1[d], 24[d], 33[d] and 34[d]: Single-Reference Obviousness Under § 103 43

10. Claim 2: The method of claim 1, wherein at least one of the future LQ or the plurality of LQs comprises one or more of a path loss (PL), shadowing (S), interference (I), signal to noise ratio (SNR), signal to interference and noise ratio (SINR), signal to interference ratio (SIR), channel quality indicator (CQI), channel state information (CQI), packet error rate (PER).....47
11. Claim 3: The method of claim 1, wherein at least one of the future LQ or the information associated with the plurality of LQs is associated with an uplink or downlink transmission.....48
12. Claim 4: The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a frequency band or a frequency channel. 49
13. Claim 5: The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a wireless communication technology. 49
14. Claim 6: The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a link partner of the UE. 50
15. Claim 7: The method of claim 1, wherein a link quality positioning information includes at least one of the determined plurality of LQs, the stored information, the estimated future positioning or the estimated future LQ. 50
16. Claim 8: The method of claim 7, wherein the UE obtains at least a portion of the link quality positioning information from a link partner or wherein the UE communicates the at least the portion of the link quality positioning information to the link parter.....51
17. Claim 9: The method of claim 7, further comprising determining a UE usage information, wherein at least a portion of the link quality positioning information is based on the UE usage information. 52
18. Claim 10: The method of claim 9, wherein the UE usage information comprises UE information indicating one or more

of a user handheld mode, a hands-free mode, a speaker phone mode, a car Bluetooth mode, a headset Bluetooth mode.....53

19. Claim 11: The method of claim 7, further comprising determining a UE environment information, wherein at least a portion of the link quality positioning information is based on the UE environment information. 54
20. Claim 12: The method of claim 11, wherein the UE environment information comprises information associated to one or more of a traffic load, a network load, an interference, time of day, whether [sic] information, day of year, season.....54
21. Claim 13: The method of claim 11, wherein the UE environment information comprises information associated with surrounding objects or information associated with a user of the UE. 55
22. Claim 14: The method of claim 13, wherein the information associated with the user of the UE includes positioning of the user of the UE or positioning of the user of the UE relative to the UE.....55
23. Claim 15: The method of claim 11, further comprising assisting determining the UE environment information using sensors of the UE. 55
24. Claim 16: The method of claim 1, further comprising allocating a resource to a UE link, wherein the allocation of the resource to the UE link is based on the estimated future LQ.....56
25. Claim 17: The method of claim 1, further comprising selecting a transmission mode for a UE link, wherein the selecting the transmission mode for the UE link is based on the estimated future LQ. 56
26. Claim 18: The method of claim 17, wherein the transmission mode comprises one or more of a modulation, a code, a modulation and coding scheme (MCS), a multiple input multiple output (MIMO) mode, a beamforming parameter, a transmit power.....57

27. Claim 19: The method of claim 1, further comprising obtaining at least one future time, and wherein the estimating the at least one future positioning is based on the at least one future time. 58
28. Claim 20: The method of claim 1, further comprising a second plurality of positionings wherein the second plurality of positionings comprises the at least one future positioning, and further comprising estimating a second plurality of LQs based on the second plurality of positionings. 59
29. Claim 21: The method of claim 20, further comprising allocating a resource block (RB) to a UE link based on the estimated second plurality of LQs. 59
30. Claim 22: The method of claim 1, wherein the plurality of positionings is constrained to a physical area. 61
31. Claim 23: The method of claim 1, wherein at least one of the plurality of positionings or the estimated at least one future positioning of the UE further comprises at least one of an error, an accuracy, a deformation, a velocity, an acceleration.....61
32. Claim 25: The method of claim 24, further comprising adjusting or changing a configuration of the UE based on the one or more neighboring LQs. 62
33. Claim 26: The method of claim 24, further comprising presenting the one or more neighboring LQs of the UE at the at least one neighboring positioning. 63
34. Claim 27: The method of claim 24, further comprising selecting a candidate positioning from the at least one neighboring positioning based on the one or more neighboring LQs. 64
35. Claim 28: The method of claim 27, further comprising presenting the selected candidate positioning to a user of the UE....65
36. Claim 29: The method of claim 24, wherein a link quality neighboring positioning information includes at least one of the determined plurality of LQs, the stored information, the estimated at least a positioning of the UE, the determined at

least one neihboring positioning, or the one or more neighboring LQs....66

37. Claim 30: The method of claim 29, further comprising determining a UE environment information, wherein at least a portion of the link quality neighboring positioning information is based on the UE environment information. 66

38. Claim 31: The method of claim 30, the UE environment information comprises information associated with a user of the UE....66

39. Claim 32: The method of claim 30, further comprising selecting a joint candidate positioning of the UE and a user of the UE, wherein the joint candidate positioning comprises a combination of a UE positioning and a user positioning relative to the UE. 67

IX. THE BOARD SHOULD NOT EXERCISE ITS DISCRETION TO DENY INSTITUTION 67

A. THE BOARD SHOULD NOT DENY REVIEW UNDER 35 U.S.C. § 325(D) 67

1. Whether the Same or Substantially the Same Art Previously Was Presented to the Office or Whether the Same or Substantially the Same Arguments Previously Were Presented to the Office....68

2. If Either Condition of the First Part of the Framework is Satisfied, Whether the Petitioner has Demonstrated that the Office Erred in a Manner Material to the Patentability of the Challenged Claims 68

B. THE BOARD SHOULD NOT DENY REVIEW UNDER 35 U.S.C. § 314(A).....70

X. CONCLUSION....71

XI. MANDATORY NOTICES (37 C.F.R. § 42.8(B))....73

A. REAL PARTIES IN INTEREST (37 C.F.R. § 42.8(B)(1))....73

B. RELATED MATTERS (37 C.F.R. § 42.8(B)(2))....74

C. LEAD AND BACK-UP COUNSEL (37 C.F.R. § 42.8(B)(3))....74

D. SERVICE INFORMATION (37 C.F.R. § 42.8(B)(4)) 75

E. FEE FOR *INTER PARTES* REVIEW 75
XII. CERTIFICATE OF SERVICE 75
XIII. CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24 78

PETITIONERS' EXHIBIT LIST

Exhibit No.	Document
1001	U.S. Patent No. 9,094,868 ("the '868 Patent")
1002	Prosecution History of U.S. Application No. 14/053,574, filed October 14, 2013, which issued as the '868 Patent
1003	U.S. Provisional Patent Application No. 61/714,151, filed October 15, 2012, to which the '868 Patent may claim priority
1004	U.S. Patent Publ. No. 2008/0248822 A1 ("Jarvinen"), published October 9, 2008
1005	U.S. Patent Publ. No. 2012/0064908 A1 ("Fox"), published March 15, 2012
1006	Docket Control Order, *Headwater Partners II LLC v. Cellco Partnership d/b/a Verizon Wireless et al.*, Case No. 2:24-cv-00007-JRG, Dkt. No. 33 (E.D. Tex. April 9, 2024)
1007	Docket Control Order, *Headwater Partners II LLC v. T-Mobile USA, Inc. et al.*, Case No. 2:24-cv-00015-JRG, Dkt. No. 42 (E.D. Tex. April 9, 2024)
1008	Federal Court Management Statistics - Profiles, June 30, 2024
1009	Order Granting Ericsson's and Nokia's Motion to Intervene as a Defendant, *Headwater Partners II LLC v. Cellco Partnership d/b/a Verizon Wireless et al.*, Case No. 2:24-cv-00007-JRG, Dkt. No. 51 (E.D. Tex. July 19, 2024)
1010	Order Granting Ericsson's and Nokia's Motion to Intervene as a Defendant, *Headwater Partners II LLC v. T-Mobile*

Exhibit No.	Document
	USA, Inc. et al., Case No. 2:24-cv-00015-JRG, Dkt. No. 63 (E.D. Tex. July 19, 2024)
1011	U.S. Patent Publ. No. 2011/0310865 A1 ("Kennedy"), published December 22, 2011
1012	Declaration of Dr. Stan McClellan, Ph.D. ("McClellan")
1013	Curriculum Vitae of Dr. Stan McClellan, Ph.D.

I. INTRODUCTION

Petitioners T-Mobile USA, Inc. ("T-Mobile"), AT&T Services, Inc. ("AT&T"), Cellco Partnership d/b/a Verizon Wireless ("Verizon"), Ericsson Inc. ("Ericsson") and Nokia of America Corporation ("Nokia") (collectively, "Petitioners") respectfully request *inter partes* review of claims 1-34 (the "Challenged Claims") of U.S. Patent No. 9,094,868 ("the '868 Patent," Ex. 1001) in accordance with 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42.100 *et seq.* The '868 Patent claims measuring and storing smartphones' ("user equipment" or "UEs") positionings and link qualities, then later estimating a UE's future location and link quality at that location. When the '868 Patent was filed in 2013, these practices were already well-known.

This Petition primarily relies on U.S. Patent Publ. No. 2008/0248822 A1 ("Jarvinen"), published October 9, 2008, which was not substantively evaluated by the Examiner. Jarvinen predates the '868 Patent, identifies the same problem as the '868 Patent and discloses the same solution as the '868 Patent.

This Petition, associated exhibits and the Declaration of Stan McClellan, Ph.D. (submitted herewith) establish the invalidity of the Challenged Claims under 35 U.S.C. § 103(a) (pre-AIA) or 35 U.S.C. § 103 (AIA).

II. GROUNDS FOR STANDING (37 C.F.R. § 42.104(a))

Petitioners certify pursuant to 37 C.F.R. § 42.104(a) that the '868 Patent is available for *inter partes* review, and that Petitioners are not barred or estopped from requesting *inter partes* review based on the grounds identified herein.

III. IDENTIFICATION OF CHALLENGE (37 C.F.R. § 42.104(b)) AND RELIEF REQUESTED (37 C.F.R. § 42.22(a))

A. Identification of Prior Art

Ex. 1004 – U.S. Patent Publ. No. 2008/0248822 A1 ("Jarvinen") is a publication of U.S. Patent Appl. No. 11/808,904 (filed June 13, 2007). Jarvinen was published on October 9, 2008, and is prior art to the '868 Patent under 35 U.S.C. §§ 102(e) and 103(a) (pre-AIA) or 35 U.S.C. §§ 102(a)(1), (a)(2) and 103 (AIA).

Ex. 1005 – U.S. Patent Publ. No. 2012/0064908 A1 ("Fox"), is a publication of U.S. Patent Appl. No. 13/135,438 (filed July 5, 2011). Fox was published on March 15, 2012, and is prior art to the '868 Patent under 35 U.S.C. §§ 102(e) and 103(a) (pre-AIA) or 35 U.S.C. §§ 102(a)(1), (a)(2) and 103 (AIA).

Neither Jarvinen nor Fox were substantively evaluated during the prosecution of the '868 Patent.

B. Statutory Grounds Upon Which the Challenge is Based

#	Challenged Claims	35 U.S.C. §	Prior Art
1	1-34	103	Jarvinen, Fox

C. Requested Relief

Petitioners respectfully request institution of an *inter partes* review pursuant to 37 C.F.R. § 42.108 and cancellation of the Challenged Claims of the '868 Patent.

IV. OVERVIEW OF THE '868 PATENT

The '868 Patent is entitled "User Equipment Link Quality Estimation Based on Positioning." The '868 Patent issued on July 28, 2015 from U.S. Patent Appl. No. 14/053,574, filed on October 14, 2013. The '868 Patent claims priority to U.S. Provisional Appl. No. 61/714,151, filed on October 15, 2012.[1]

A. Specification

The '868 Patent relates to "estimating a user equipment link quality" based on the position of the user equipment (or "UE," e.g., a smartphone). ('868 Patent, Abstract.) "Link quality" refers to any measurement of the quality of the connection

[1] Petitioners do not concede that the Challenged Claims are entitled to the benefit of the provisional application, however, all art identified by Petitioners antedates October 15, 2012.

between a UE and a base station[2] (McClellan, ¶25); and a UE's "position" includes its "location" or "orientation"[3] ('868 Patent, cl. 1; McClellan, ¶25).

A UE connects to a base station in order to send or receive information in the cellular network. (McClellan, ¶26.) Figure 8 shows the UE (820) and its connection to the base station (800):

[2] According to the '868 Patent, link quality could include one or more of "path loss (PL), shadowing (S), interference (I), signal to noise ratio (SNR), signal to interference and noise ratio (SINR), signal to interference ratio (SIR), channel quality indicator (CQI), channel state information (CQI), packet error rate (PER)." ('868 Patent, cl. 2.)

[3] A UE's "orientation" refers to the angle at which it is positioned relative to the base station. (McClellan, n.1.)

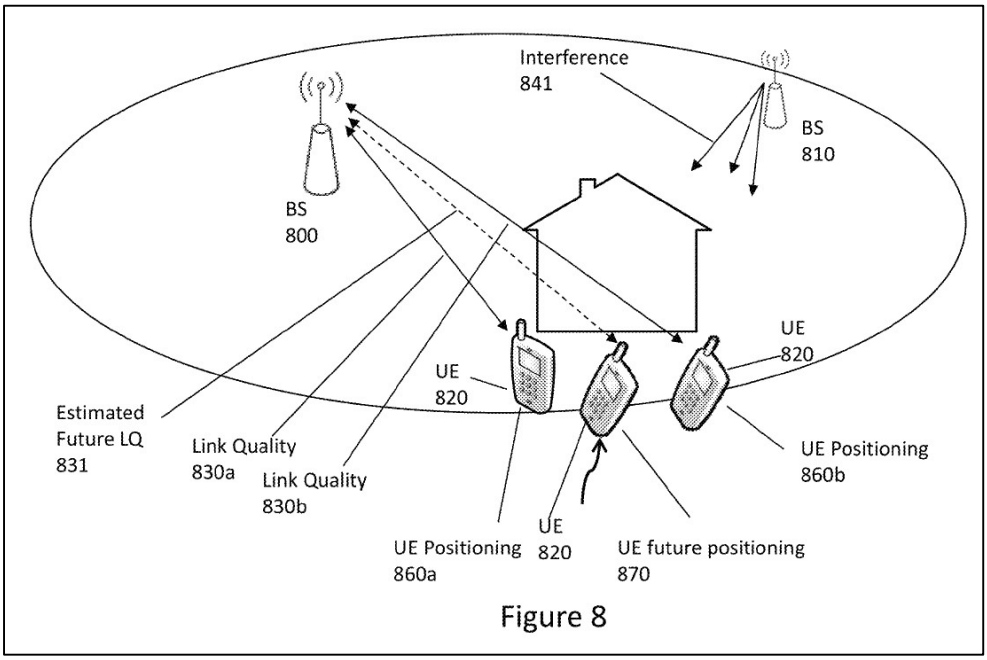


Figure 8

('868 Patent, Fig. 8.) That connection has a link quality (e.g., 830a, 830b). (*Id.* at 24:40-46.) A high link quality helps the UE and base station "exploit high data rates while providing desirable robustness of the data communication." (*Id.* at 1:24-27.) This link quality, however, "varies significantly over time, space (for example movement of the user equipment), frequency band, etc., for example due to space/time/frequency selective fading, or shadowing from objects (buildings, trees, etc.), etc." (*Id.* at 1:19-23.) As a result of this variance, "[l]ink quality information exchanged between the base station and the user equipment may become stale (if not updated fast enough)[.]" (*Id.* at 1:29-33.)

The '868 Patent seeks to solve this alleged problem of monitoring and maintaining link quality by "estimating a user equipment link quality based on a

positioning of the user equipment," and storing that information. (*Id.* at 1:33-36.) Later, the '868 Patent teaches predicting a UE's future positioning and link quality at that future position based on that stored information. (*Id.*) Specifically, the patent teaches:

1. Collecting link qualities at several possible UE positions or orientations;

2. Storing the link qualities at those positions;

3. Estimating the future position of a UE; and

4. Estimating the link quality that the UE will experience when it is at the future position.[4]

(*See id.* at 1:40-64, 24:46-54 (estimating different link qualities (830a, 830b) at different possible UE positions (860a, 860b)), 24:54-62 (storing and using those positions when the system estimates the future position of a UE (870) and its likely link quality at that position (831)).)

---

[4] Either a base station, a UE or some other processing unit can perform these steps. (*See id.* at 24:40-25:2 ("at least one of a controller of the base station 800, a controller of the UE device 820, a controller (not shown) associated with the system, or a combination of the listed controllers is operative to determine a plurality of link qualities (LQs) . . ."), 26:20-40 (UE performing the processing), cl. 33.)

An alleged benefit of estimating a UE's future location or orientation as well as its future link quality is that the network can adjust channel parameters before the UE reaches a future position. (*Id.* at 26:45-51 ("[T]he scheduler assigns resources to each of the plurality of UE devices based on the plurality of estimated future LQs[.]"). *See also id.* at 27:24-35.) The network can also adjust transmission modes for the UE based on these estimations. (*Id.* at 27:36-46 ("selecting the transmission mode for the UE link is based on the estimated future LQ 831.").) According to the '868 Patent, making connection configuration decisions before the UE is at a given position or orientation "may improve one or more of the link efficiency, link robustness, PER, spectral efficiency, latency, of the wireless communication directed by scheduler." (*Id.* at 25:27-32.)

B. Prosecution History

The '868 Patent's prosecution history is submitted as Ex. 1002. The application that issued as the '868 Patent, U.S. Application No. 14/053,574, was filed on October 14, 2013. It claims priority to U.S. Provisional Application No. 61/714,151, filed on October 15, 2012, which is submitted as Ex. 1003.

The applicant filed a first information disclosure statement ("IDS") on January 14, 2014, which cited 70 references, including Jarvinen. (Ex. 1002, 125-38.) The Examiner initialed the bottom of each page of the IDS, and indicated that

the closest prior art of record was U.S. Patent Publ. No. 2011/0310865 ("Kennedy"), which the Examiner found in their search. (*Id.* at 168-83.) A notice of allowance issued on April 1, 2015, about seventeen months after the application was filed, but the Examiner issued no substantive office actions. (*Id.* at 163.)

As discussed in Section IX.A, it was material error that the Examiner did not address the Challenged Claims at least in view of the technical disclosures and teachings of Jarvinen and Fox, which render those claims invalid.

C. Priority Date

The '868 Patent claims priority to U.S. Provisional Application No. 61/714,151, filed on October 15, 2012 and submitted as Ex. 1003. The '868 Patent issued from a "transition application" because its application straddled the dividing line between pre-AIA and AIA patents: March 16, 2013. (*See* Manual of Patent Examining Procedure ("MPEP") § 2159.02; Exs. 1002, 1003.) Specifically, the '868 Patent's provisional application was filed before that date (October 15, 2012), while its non-provisional application was filed after that date (October 14, 2013). (*See* Exs. 1002, 1003.) For any such transition application, "[i]f there is ever even ***a single claim***[5] to a claimed invention in the [non-provisional] application having ***an***

[5] All emphasis in this Petition is added, unless otherwise noted.

effective filing date on or after March 16, 2013, [then] AIA 35 U.S.C. 102 and 103 apply in determining the patentability of every claimed invention in the application." (MPEP § 2159.02.)

Performing this analysis, however, is unnecessary. First, as discussed above in Section III.A, all references relied upon for the grounds of unpatentability addressed in this Petition constitute prior art under both pre-AIA and AIA standards. Second, all prior art relied upon for the grounds of unpatentability addressed in this Petition pre-date the '868 Patent's provisional filing date of October 15, 2012. Third, the Challenged Claims are invalid under both pre-AIA and AIA standards.

D. Challenged Claims

The '868 Patent has four independent claims (1, 24, 33 and 34) that are substantially similar to one another, and each of their limitations are reproduced in Sections VIII.A.1-VIII.A.9. Claim 1 determines and stores link qualities at positionings of a UE, estimates the UE's future position and estimates future link quality at the future position. (McClellan, ¶30.) Claim 24 uses the UE's nearby "neighboring position" to estimate link quality instead of its "future position." (McClellan, ¶30.) Claim 33 is a system claim, and directed to the UE's components and functions. (*Id.* at ¶30.) Claim 34 adds that the positionings are of one or more UEs, and the position and link quality estimation is for a second UE. (*Id.* at ¶30.)

Dependent claims 2-23 and 25-32 add various limitations to the independent claims, and each is reproduced in Sections VIII.A.10-VIII.A.39. As explained in detail below, Claims 1-34 of the '868 Patent would have been obvious in view of the prior art.

V. LEVEL OF ORDINARY SKILL IN THE ART

For purposes of this *inter partes* review, Petitioners assert that a hypothetical person having ordinary skill in the art ("POSITA") in the context of the '868 Patent would have been someone with at least (1) a bachelor's degree in electrical engineering, computer engineering/science, or a related scientific field, and (2) either (a) a master's degree in electrical engineering, computer engineering/science, or a related filed, or (b) two or more years of work or research experience in wireless networking and/or computing. (*Id.* at ¶20.)

VI. CLAIM CONSTRUCTION (37 C.F.R. § 42.104(b)(3))

In an *inter partes* review, claims are "construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b)." (37 C.F.R. § 42.100(b).) Claims must be given their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the invention in light of the specification and the prosecution history pertaining to the patent. *Id. See also Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-1313 (Fed.

Cir. 2015) (*en banc*); 83 Fed. Reg. 51,340. For the purposes of this Petition, Petitioners contend that all claim terms should be given their plain and ordinary meaning as would be understood in the context of the '868 Patent's disclosure.

VII. OVERVIEW OF THE PRIOR ART

A. Jarvinen

Jarvinen relates to "managing transmission conditions in a mobile telecommunication system according to movement of a mobile terminal[.]"[6] (Jarvinen, Abstract; McClellan, ¶35.) Like the '868 Patent, Jarvinen discloses a method of adapting the communications link between a UE and a base station. (Jarvinen, ¶¶0001 ("The invention relates to radio link adaptation in a mobile telecommunication system."), 0004 ("An object of the invention is to provide an improved solution for radio link adaptation."); McClellan, ¶35.) Jarvinen's Figure 1 shows "a mobile terminal 100 [that] is currently communicating with a first base station 120":

[6] A "mobile terminal" is synonymous with a UE. (McClellan, ¶35.)

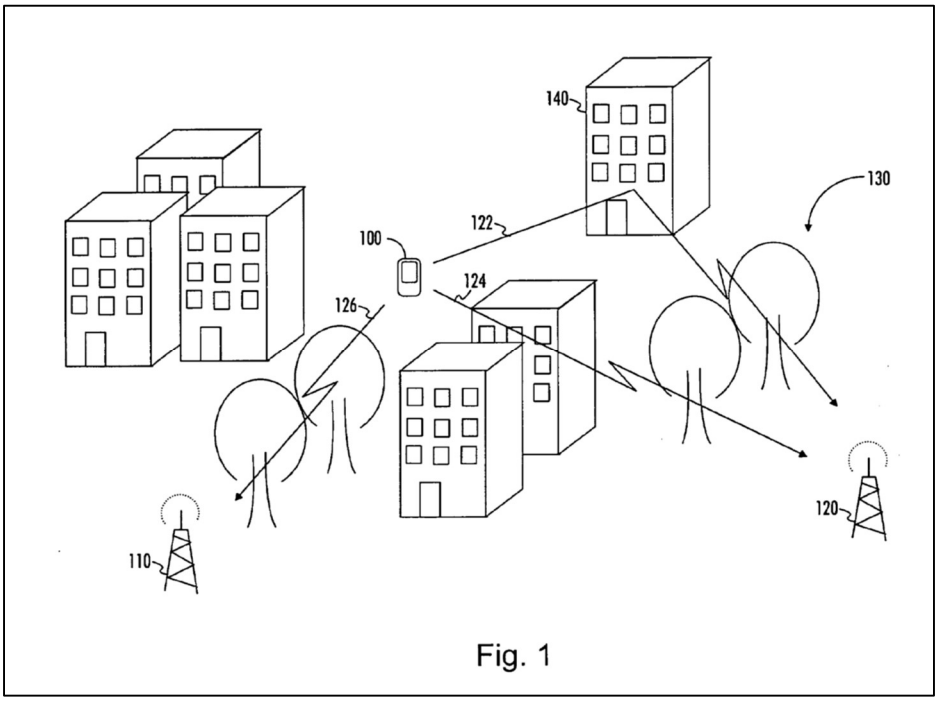


Fig. 1

(Jarvinen, ¶¶0011, 0019, Fig. 1; McClellan, ¶35.) Jarvinen states that "[r]adio link adaptation is an important factor in a mobile telecommunication system in order to react to variations in a radio channel environment." (Jarvinen, ¶0002. *See also id.* at ¶¶0016-18; McClellan, ¶35.)

Jarvinen states that a then existing solution to the link quality degradation problem was to "perform[] a channel estimation procedure based on a pilot sequence transmitted from the radio transmitter [e.g., the base station] to the radio receiver [e.g., the UE]." (Jarvinen, ¶0003; McClellan, ¶36.) After channel estimation is performed, "the radio receiver [e.g., the UE] instructs the radio transmitter [e.g., the base station] to change the transmission parameters to ones that are more optimal for the current radio channel environment." (Jarvinen, ¶0003; McClellan, ¶36.)

Jarvinen, however, criticizes this method of link adaptation as too slow to react: "action is taken after the radio channel properties have changed, i.e. the quality of a ***transmitted information signal has degraded before action is taken to remedy the degradation***." (Jarvinen, ¶0003, Fig. 1; McClellan, ¶36.)

To speed up the link adaptation process, Jarvinen discloses the same solution as the '868 Patent:

1. Collecting link qualities at several possible UE positions or orientations; (*See* Section VIII.A.3; Jarvinen, ¶¶0009, 0031, 0034, 0036, 0044, cls. 6-8, 26, 27, Fig. 4; McClellan, ¶37.)

2. Storing the link qualities at those positions; (*See* Sections VIII.A.3, VIII.A.4; Jarvinen, ¶¶0021, 0035-47, cl. 7, Figs. 3, 4; McClellan, ¶37.)

3. Estimating the future position of a UE; (*See* Sections VIII.A.5, VIII.A.6; Jarvinen, ¶¶s 0048-66, Fig. 5; McClellan, ¶37.) and

4. Estimating the link quality that the UE will experience when it is at the future position. (*See* Sections VIII.A.7-VIII.A.9; Jarvinen, ¶¶0035-66, Figs. 3, 5; McClellan, ¶37.)

Central to Jarvinen's proposed solution is its database, shown in Figure 3 below, which stores UE link qualities ("Tx Properties") at different geographic locations ("Geogr. Location"):

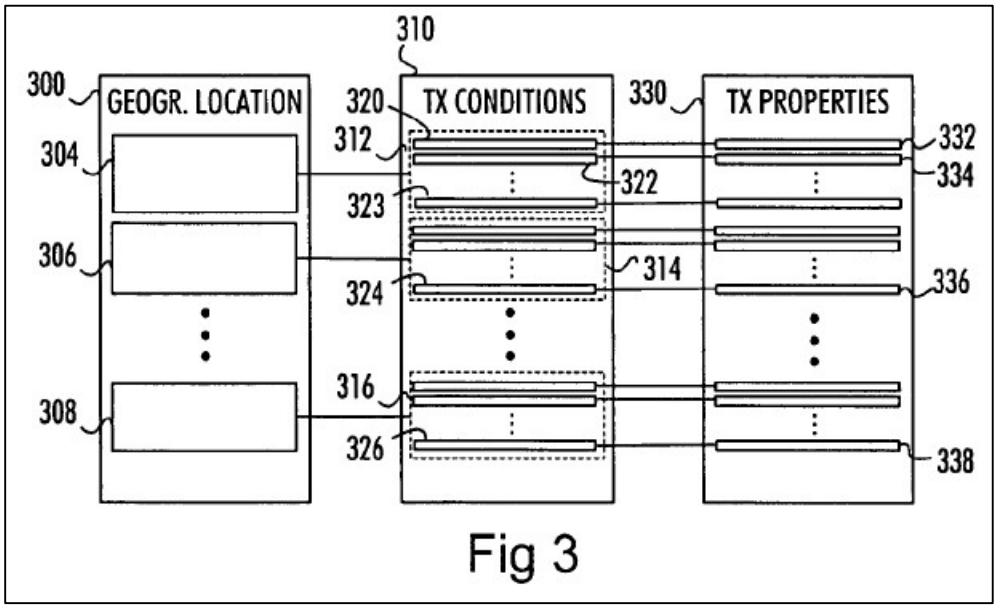


Fig 3

(Jarvinen, Fig. 3. *See also id.* at ¶0035 ("the base station then in block 406 stores the ***location of the mobile terminal*** in a first data field 300 in the database . . . the base station stores, in block 410, ***a measured reception level of the signal received from the mobile terminal in a third data field 330 of the database to form a transmission property value 332*** . . ."), Fig. 4; McClellan, ¶37.) The remaining data in the database, "Tx Conditions," refers to "radio system parameters, such as the transmission frequency and a serving base station but also other conditions such as bearing of the mobile terminal and transmit power[,]" that can be adjusted to affect link quality. (Jarvinen, ¶0041; McClellan, ¶37.)

Jarvinen's benefits mirror an alleged benefit of the '868 Patent: the network can accommodate the UE's future needs before waiting to measure channel quality at a future position. "When provided with knowledge of data transmission properties

(or quality measures of a communication link) obtainable with different transmission conditions from a given geographical location, ***one may select appropriate transmission conditions for a mobile terminal*** located in the geographical location[,]" and Jarvinen explains that, by estimating the UE's future positioning and link quality, "optimal transmission conditions may be selected ***before*** a change in the radio channel environment to prevent the degradation of signals." (Jarvinen, ¶0031; McClellan, ¶38.)

B. Fox

Fox relates to, among other things, a radio access network "controller that controls allocation of network resources to the mobile terminals," and "gauges radio conditions available to the mobile terminals[.]" (Fox, cl. 1; McClellan, ¶39.) Like the '868 Patent and Jarvinen, Fox uses previously measured link qualities at specific locations to estimate UEs' future link qualities at future locations. (Fox, cl. 8 ("the controller uses a record of radio quality across coverage area and the calculated location and velocity of one of the mobile terminals to estimate radio conditions available to the one of the mobile terminals at a future location"), Figs. 15A, 15B; McClellan, ¶39.)

The controller first monitors the communications link quality between base station and UE. (Fox, ¶¶0043 ("The radio measurements may include received

signal strength, transmit power levels, neighbour cell measurements."), 0048 ("The radio link quality measurements may include CQI, ACK/NACK ratios, BLER, Frame Errors Rates, BERs, Qqual, RSSI, RSCP . . . etc."); McClellan, ¶40.) The controller then stores this information along with the location where it measured the link quality. (Fox, ¶0022 ("The controller may build and maintain ***a record of radio quality across a coverage area of the network*** . . . The record may be in the form of ***a map of the coverage area, indicating which areas of the coverage area provide which qualities of radio coverage***."); McClellan, ¶40.)

The controller later uses "the record of radio quality across the coverage area and the calculated present location and velocity of one of the mobile terminals to ***estimate the radio conditions available to that mobile terminal at a future location***[.]" (Fox, ¶0022; McClellan, ¶41.) Once the controller estimates link quality at the future location, it can accordingly allocate the most optimal radio resources, including resource blocks, to the UE. (Fox, ¶¶0022 (the controller can "control the transmission of data between the radio access network and that mobile terminal at the calculated location in dependence thereon."), 0566 ("The radio resource allocation may be defined for a type of application or user—the ***pre-allocated resource blocks*** or Codes, or Timeslots."), 0583 ("The radio resource allocation may be defined for a type of application or user, by allocating particular

resource blocks, codes or time slots."); McClellan, ¶41. *See also* Fox at ¶0578 ("Resource Blocks in LTE").)

VIII. GROUNDS OF UNPATENTABILITY

As evidenced by the '868 Patent and the references cited below, a person of ordinary skill in the art understood that it would be possible to predict a UE's future position as well as its link quality at that position, then use that information to adapt the communications link between the UE and base station. (*See* McClellan, ¶¶23-122.) As discussed below, Jarvinen, either alone or in view of Fox and further in view of a POSITA's knowledge, arrived at the same solution claimed by the '868 Patent prior to its priority date. (*Id.*) Thus, there is a reasonable likelihood that Petitioners will show that Claims 1-34 of the '868 Patent are not patentable.

A. Ground 1: Claims 1-34 Are Rendered Obvious by Jarvinen and Fox and Further in View of a POSITA

As explained in this section, all of the limitations of Claims 1-34 are disclosed or suggested in Jarvinen, either alone or in view of Fox and further in view of a POSITA's knowledge. (*Id.*)

1. 1[pre] A method, comprising

24[pre] A method, comprising

34[pre] A method, comprising

To the extent the claims' preambles are limiting, Jarvinen discloses these limitations. As discussed in detail below and in Sections VII.A and VIII.A.2-VIII.A.9, Jarvinen discloses systems and methods to determine and store link qualities corresponding to UE positions, estimate future UE positions and estimate a future link quality for the UE at its future positions. (*See* Jarvinen, Abstract ("A method for managing transmission conditions in a mobile telecommunication system . . ."), cls. 1-20 (claiming "methods"), 21-41, Figs. 4, 5; McClellan, ¶43.)

2. 33[pre] A user equipment (UE), the UE comprising:

a transceiver operative to communicate with a link partner device through a communication link, wherein the communication link includes a link quality;

a controller, the controller operative to:

Claim 33 is a system claim, and directed to a UE's components and functions. Claim 33's preamble recites a UE having (1) a transceiver that communicates with a link partner device (e.g., a base station) over a communication link that has link quality; and (2) a controller operative to perform functions. (McClellan, ¶44.) Jarvinen's Figure 2 discloses all components recited in Claim 33's preamble:

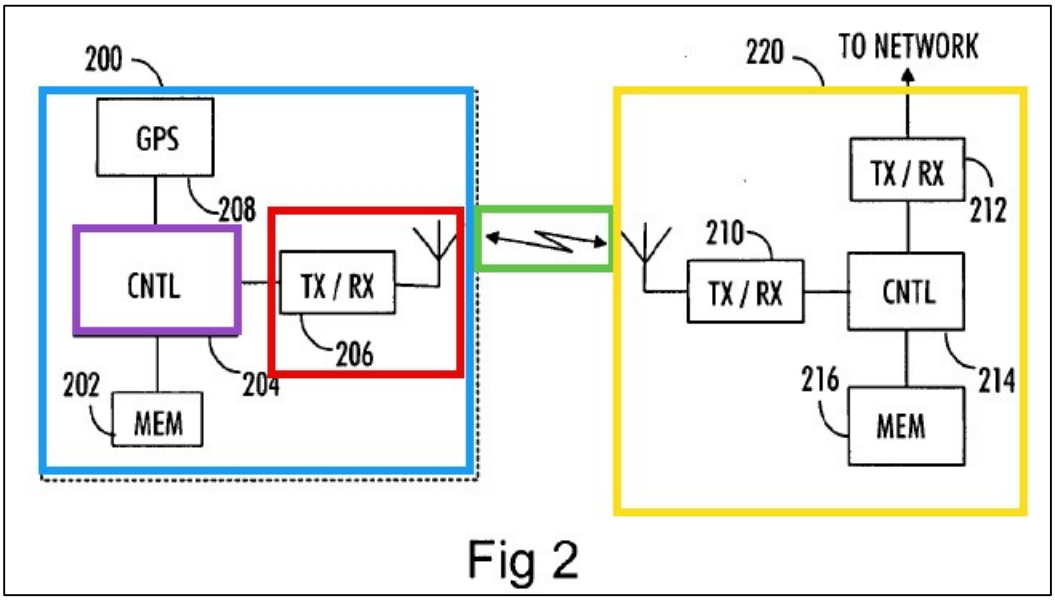


Fig 2

(Jarvinen, Fig. 2, ¶0022 ("FIG. 2 illustrates block diagrams of a mobile terminal 200 and a base station 220 of a typical mobile telecommunication network."); McClellan, ¶45.)

First, Jarvinen discloses a UE having a transceiver. Figure 2 shows "a mobile terminal 200 [annotated in blue] and a base station 220 [annotated in yellow] [.]" (Jarvinen, ¶0022; McClellan, ¶46.) The mobile terminal's "communication interface 206" (annotated in red) is a transceiver that "may perform analog operations necessary for transmitting and receiving radio signals." (Jarvinen, ¶0022; McClellan, ¶46.) The mobile terminal's link partner is the base station, and they communicate over a communications link (annotated in green). (Jarvinen, ¶0022 ("The base station 220 comprises a first communication interface 210 to provide an

air interface connection to one or several mobile terminals, such as mobile terminal 200."); McClellan, ¶46.)

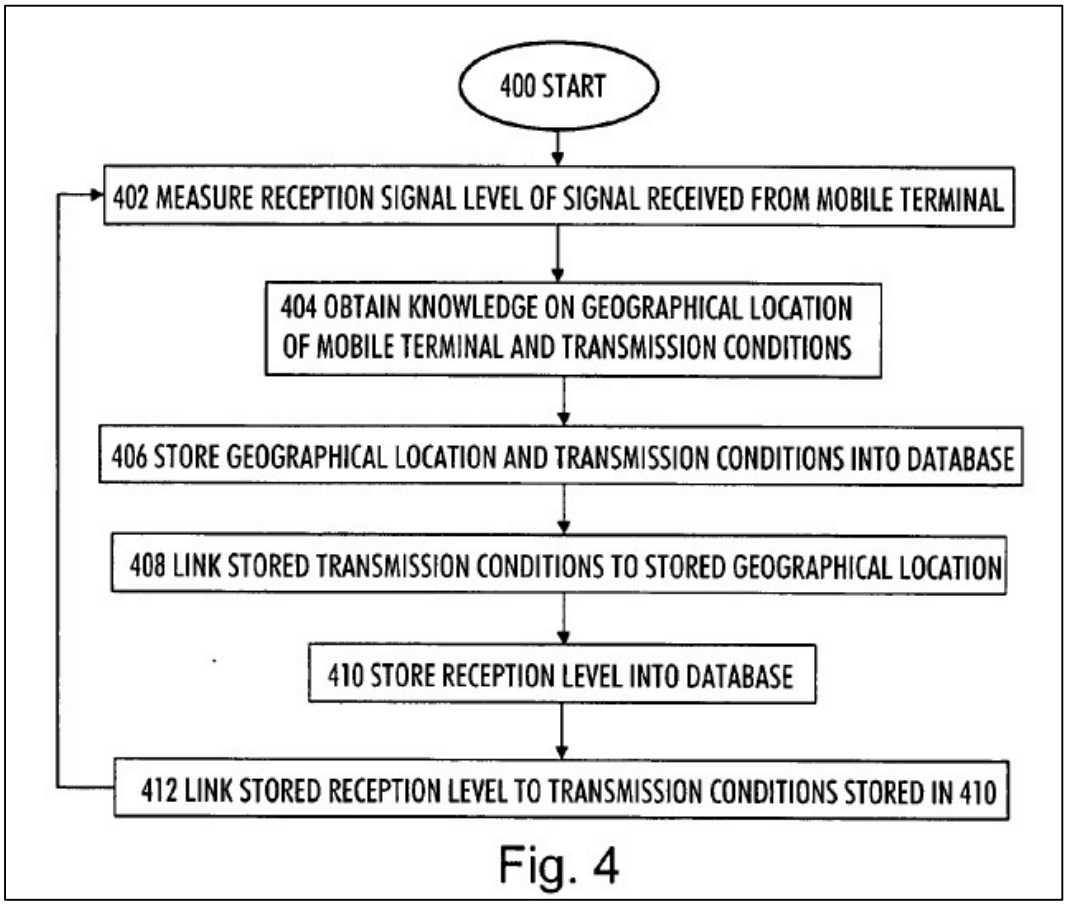
That communications link has a link quality. (Jarvinen, ¶¶0034 ("The reception level of the signal may be a received signal strength indicator (RSSI) calculated in any case by the base station for other purposes. . . . another communication ***link quality*** indicator may be measured, such as a signal-to-interference power ratio."), 0035 ("the base station stores, in block 410, a measured reception level of the signal received from the mobile terminal"), cls. 6 ("measuring a communication link quality indicator from a received signal"), 7, 8, 26, 27; McClellan, ¶47. *See also* Jarvinen at ¶¶0036, 0044, Fig. 4.)

Second, Jarvinen discloses the UE having a controller (annotated in purple). (Jarvinen, ¶0027 ("The mobile subscriber unit 200 may further comprise a processing unit 204 to control functions of the mobile subscriber unit 200."); McClellan, ¶48. *See also* Jarvinen at ¶¶0028, 0048, cls. 21, 38.)

3. 1[a] / 24[a] / 33[a] determining a plurality of link qualities (LQs) of a user equipment (UE) for a plurality of positionings of the UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of the UE

34[a] determining a plurality of link qualities (LQs) of one or more user equipment (UE) for a plurality of positionings of the one or more UE, wherein at least one of the plurality of positionings includes at least a location or an orientation of a first UE of the one or more UE

Jarvinen discloses methods and systems of determining a plurality of UE link qualities for a plurality of UE positionings. (McClellan, ¶49.) Figure 4 is a flow chart depicting how Jarvinen collects and stores information associating a UE's location with its link quality at that location:



(Jarvinen, Fig. 4. *See also id.* at ¶0034; McClellan, ¶49.)

The process begins when the system[7] "measures the level of a signal received from a given mobile terminal in block 402[.]" (Jarvinen, ¶0034; McClellan, ¶50.)

[7] Although Jarvinen describes a base station performing the steps in Figure 4, "the database may be stored in a memory unit of ***the mobile terminal***." (Jarvinen, ¶0045. *See also id.* at ¶¶0057, 0067, cls. 21 ("receive information on a ***geographical***

This "reception level" "may be a received signal strength indicator (RSSI)" or another measurement that "reflects the quality of the radio environment." (Jarvinen, ¶¶0034, 0044; McClellan, ¶50. *See also* Jarvinen at ¶¶0036, 0044, cls. 6 ("measuring a communication link quality indicator from a received signal"), 7, 8, 26, 27, Fig. 4.) "As an alternative to the reception signal level, another communication link quality indicator may be measured, such as a signal-to-interference power ratio." (Jarvinen, ¶0034. *See also* '868 Patent, 19:34-45 ("Signal to Noise Ratio (SNR), Signal to Interference and Noise Ratio (SINR)"), cl. 2 ("at least one of the future LQ or the plurality of LQs comprises one or more of . . . signal to noise ratio (SNR), signal to interference and noise ratio (SINR), signal to interference ratio (SIR), . . .").)

The process also involves "obtain[ing] knowledge of the geographical location of the mobile terminal at the time of transmission of the signal and transmission conditions used in the transmission of the signal." (Jarvinen, ¶0034;

---

location of a mobile terminal having a ***communication link with a base station*** of a mobile telecommunication system"), 26 ("the processing unit is further configured to measure a ***communication link quality indicator***"), 38 ("The apparatus of claim 21, wherein the apparatus is the ***mobile terminal***").)

McClellan, ¶51. *See also* Jarvinen at cls. 1-41.) The process repeats over time, and the system will determine link qualities and positionings for a plurality of UEs (and for a single UE). (Jarvinen, ¶0036 ("the process returns from block 412 to block 402" and determines "reception levels of signals received from ***the same mobile terminal*** or from ***other mobile terminals*** at different geographical locations and with different transmission conditions"); McClellan, ¶51.)

Jarvinen then discloses storing the many UEs' positionings and link qualities at those positions in a database, shown in Figure 3:

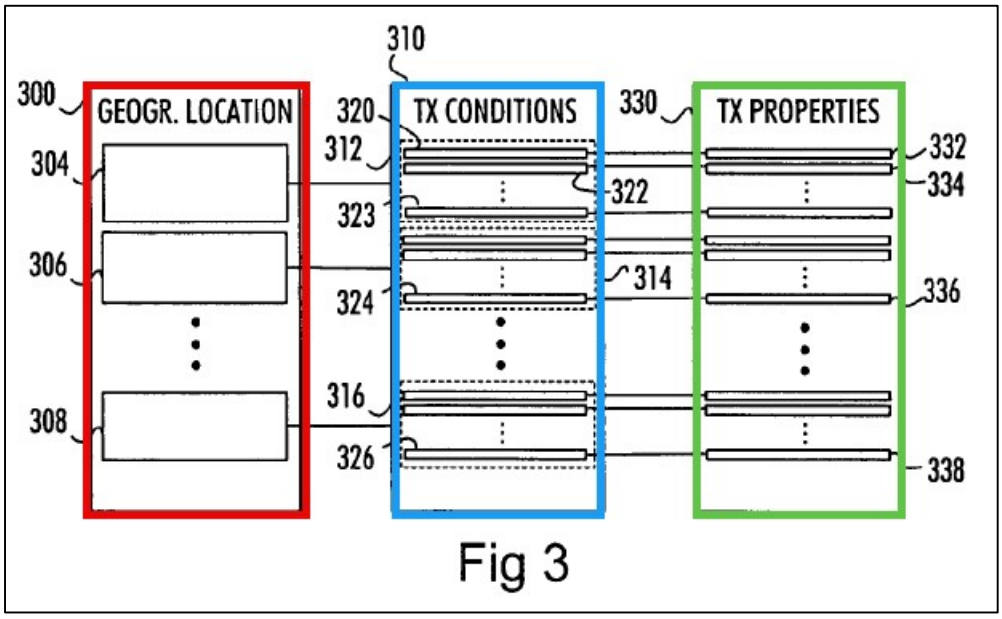


Fig 3

(Jarvinen, Fig. 3; McClellan, ¶52. *See also* Jarvinen at ¶¶0035-47.) The database stores:

1. **Geographical Location** (annotated in red) – The position of the UE in geographic space. (*See* Jarvinen, ¶¶0021 (describing methods of locating UEs in geographic space), 0029 (same); McClellan, ¶52.)

2. **Transmission Conditions** (annotated in blue) – The radio system parameters used to transmit information between UE and base station. (Jarvinen, ¶0041 ("In general, the transmission conditions include options available to the mobile terminal to affect the quality of the communication link[.]"); McClellan, ¶52.)

3. **Transmission Properties** (annotated in green) – The link quality at the geographic location. (Jarvinen, ¶¶0009 ("transmission property values representing quality of transmission"), 0031 ("data transmission properties (or quality measures of a communication link)"), 0034 ("another communication link quality indicator may be measured, such as a signal-to-interference power ratio."), 0044 (referring to "transmission property values" as "describing the quality of the communication link"); McClellan, ¶52. *See also* Jarvinen at ¶0036, cls. 6 ("measuring a communication link quality indicator from a received signal"), 7, 8, 26, 27, Fig. 4.)

These three sets of data are linked together in the database, and Transmission Properties (i.e., link quality) may be linked directly to Geographical Location. (Jarvinen, ¶0038 ("the transmission property values included in the third data field 330 ***may be linked directly to the corresponding location values*** . . . ***the order of the second data field 310 and the third data field 330 may be reversed*** compared to that illustrated in FIG. 3."). *See also id.* at ¶0035, cl. 7; McClellan, ¶53.)

Limitation 34[a] requires that the method determine link qualities and positionings for more than one UE. Because, as discussed above, Jarvinen discloses a method to determine link qualities and positions for more than one UE, Jarvinen meets Limitation 34[a] as well. (Jarvinen, ¶0036 ("the process returns from block 412 to block 402" and determines "reception levels of signals received from the same

mobile terminal or ***from other mobile terminals*** at different geographical locations and with different transmission conditions"); McClellan, ¶54.)

The "positioning" limitation can be met by either "a location or an orientation of the UE[,]" and Jarvinen also discloses a UE's orientation, or "bearing." Jarvinen states that "[t]he transmission conditions may include radio system parameters, such as the transmission frequency and a serving base station but also other conditions such as ***bearing of the mobile terminal*** and transmit power." (Jarvinen, ¶0041, cls. 12, 31; McClellan, ¶55.) UE orientation can be determined using "motion sensors or a compass provided in the mobile terminal." (Jarvinen, ¶0043; McClellan, ¶55.) "With the knowledge of the location of the base station, the mobile terminal is able to determine its bearing with respect to the base station[,]" and "[l]ocations of base stations may be stored in the database by utilizing the same notation as that used for storing the location values." (Jarvinen, ¶0043; McClellan, ¶55. *See also* Jarvinen at ¶¶0058-59, 0066, 0072.)

4. 1[b] / 24[b] / 34[b] storing information associated with the plurality of LQs for the plurality of positionings

33[b] store information associated with the plurality of LQs for the plurality of positionings

As discussed in Section VIII.A.3, Jarvinen discloses storing information associated with the plurality of link qualities for the plurality of positionings (e.g.,

UE locations) in a database. (McClellan, ¶56.) That database is shown in Figure 3, where link qualities are stored under "Transmission Properties," UE positioning is stored under "Geographical Location" and those pieces of information are associated with one another:

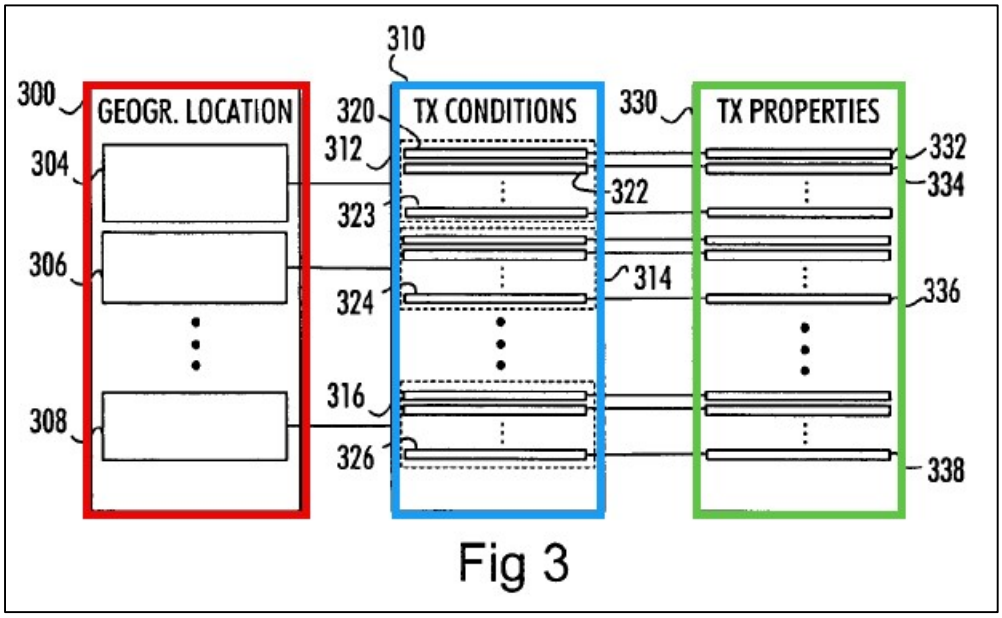


Fig 3

(Jarvinen, Fig. 3; McClellan, ¶56. *See also* Jarvinen at ¶¶0035-47, cls. 3, 6, 26, 37, 38.)

5. 1[c] / 33[c] estimating at least one future positioning of the UE

34[c] estimating at least one future positioning of a second UE

Jarvinen discloses estimating the "future positioning" of a UE or of a "second UE." (McClellan, ¶57.) This process is shown in Figure 5:

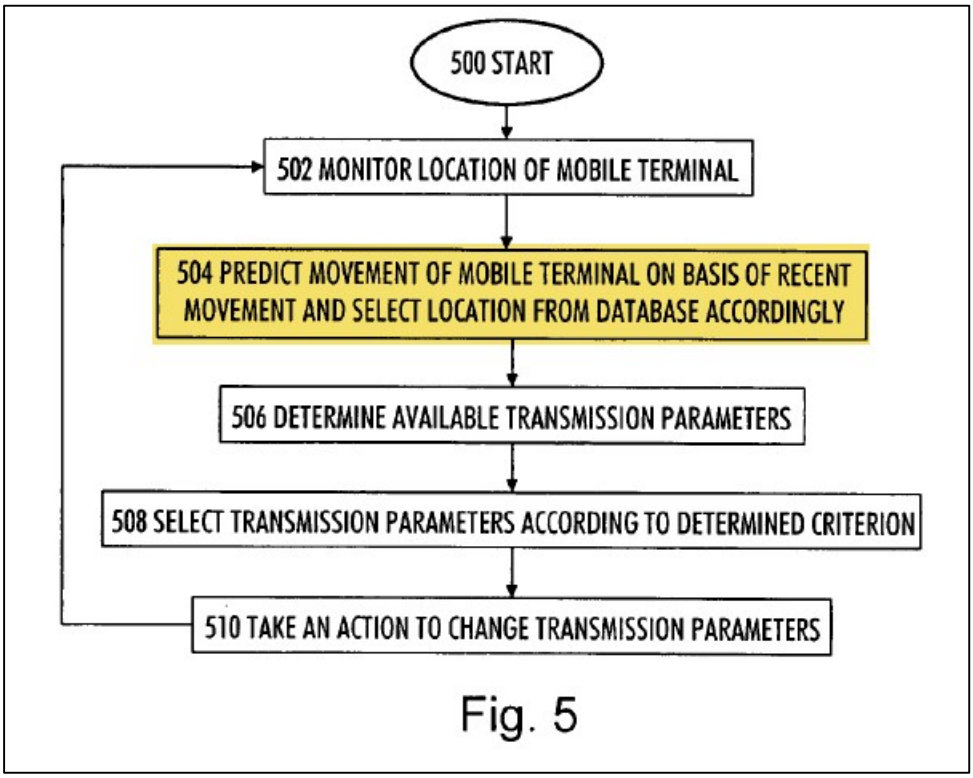


Fig. 5

(Jarvinen, Fig. 5; McClellan, ¶57. *See also* Jarvinen at ¶¶0048-66.)

The method starts by monitoring the UE's current location (Block 502). (Jarvinen, ¶0049 ("The movement of the mobile terminal is tracked in block 502 with the help of information received from a positioning device included in the mobile terminal"); McClellan, ¶58.) Next, the method estimates a UE's future location. (Jarvinen, ¶0050 ("The geographical location (a limited area) ***the mobile terminal will be entering next is predicted in block 504***, for example, by extrapolating the latest movement of the mobile terminal, i.e. the stored history of the movement of the mobile terminal."); McClellan, ¶58. *See also* Jarvinen at 0065 ("Block 504 may be carried out, i.e. the ***movement of the mobile terminal may be***

predicted and the corresponding location selected from the database, as described above."), cls. 2, 22.)

Limitation 34[c] adds that estimating at least one future positioning must be for a "second UE," and Jarvinen discloses this element as well. (McClellan, ¶59.) As discussed in Section VIII.A.3, Jarvinen discloses estimating the location and associated link qualities of multiple UEs over time. (*See* Jarvinen, ¶0036; McClellan, ¶59.) After Jarvinen's method determines the position of a first UE, it will continue to determine the future location of a "second UE," as further discussed in this Section VIII.A.5. (McClellan, ¶59.)[8]

6. 24[c] estimating at least a positioning of the UE;

determining at least one neighboring positioning of the positioning of the UE

Jarvinen discloses estimating a UE's current positioning (e.g., location) and determining at least one of that UE's neighboring positioning. (Jarvinen, ¶0064 ("the mobile terminal may check the database for a ***neighboring (or nearby) location*** stored in the database"); McClellan, ¶60.) Figure 5 shows a method of

[8] As discussed in Section VIII.A.3, Jarvinen describes a UE performing the disclosed method instead of, or in addition to, the base station. (*See* Jarvinen, cls. 21, 22, 38.)

estimating a UE's location before estimating a neighboring (e.g., future) location. (McClellan, ¶60.) Block 502 (highlighted in green) shows the method's real-time tracking of a UE's location. (Jarvinen, ¶0049 ("The movement of the mobile terminal is tracked in block 502 with the help of information received from a positioning device included in the mobile terminal"); McClellan, ¶60.)

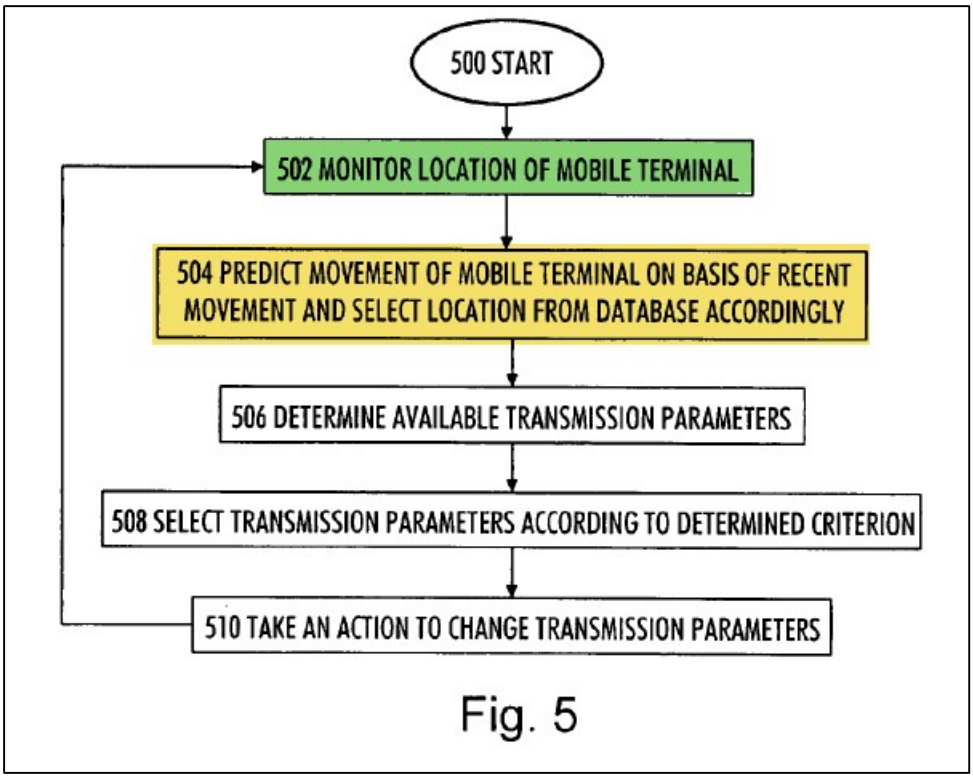


Fig. 5

(Jarvinen, Fig. 5; McClellan, ¶60. *See also* Jarvinen at ¶¶0048-66.) Block 504 (highlighted in yellow) shows the method's determination of the UE's neighboring location:

> ***The geographical location (a limited area) the mobile terminal will be entering next is predicted in block 504***, for example, by extrapolating the latest movement of the mobile terminal, i.e. the stored history of the

> movement of the mobile terminal. . . . ***the prediction algorithm may predict that the upcoming location of the mobile terminal is the next geographical location located along that straight path*** and included in the database. Accordingly, ***a geographical location value closest to the predicted next geographical location along the path of the mobile terminal*** is selected from the first data field 300 of the database in block 504.

(Jarvinen, ¶0050; McClellan, ¶60. *See also* Jarvinen at ¶0065 ("Block 504 may be carried out, i.e. the movement of the mobile terminal may be predicted and the corresponding location selected from the database, as described above."), cls. 2, 22.)

7. 1[d] estimating a future link quality (LQ) of the UE at the at least one future positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE

24[d] estimating one or more neighboring link qualities (LQs) of the UE at the at least one neighboring positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE.

33[d] estimate a future link quality (LQ) of the UE at the at least one future positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE

34[d] estimating a future link quality (LQ) of the second UE at the at least one future positioning of the second UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the one or more UE

Jarvinen discloses estimating a future link quality of a UE at a future position (e.g., location) based on stored information about a plurality of link qualities at UE positions. (McClellan, ¶61.)

As discussed above at Sections VIII.A.3 and VIII.A.4, Jarvinen determines UE locations and link qualities at those locations, then stores them in the database depicted in Figure 3:

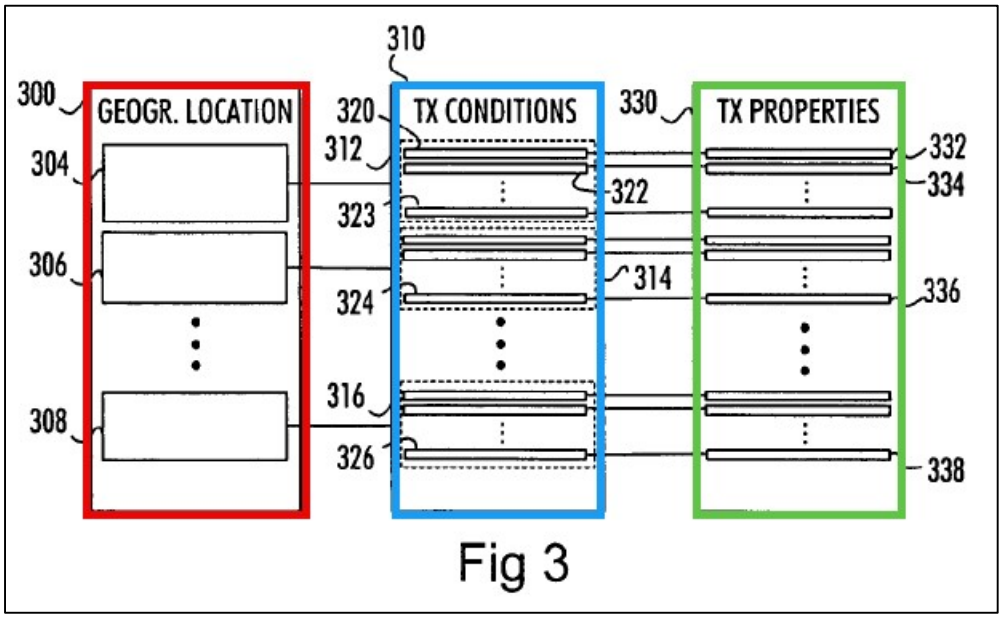


Fig 3

(Jarvinen, Fig. 3; McClellan, ¶62. *See also* Jarvinen at ¶¶0035-47.) Jarvinen later estimates a future location of a UE, as discussed in Section VIII.A.6. Jarvinen's estimation of future UE location is shown at Block 504 in Figure 5:

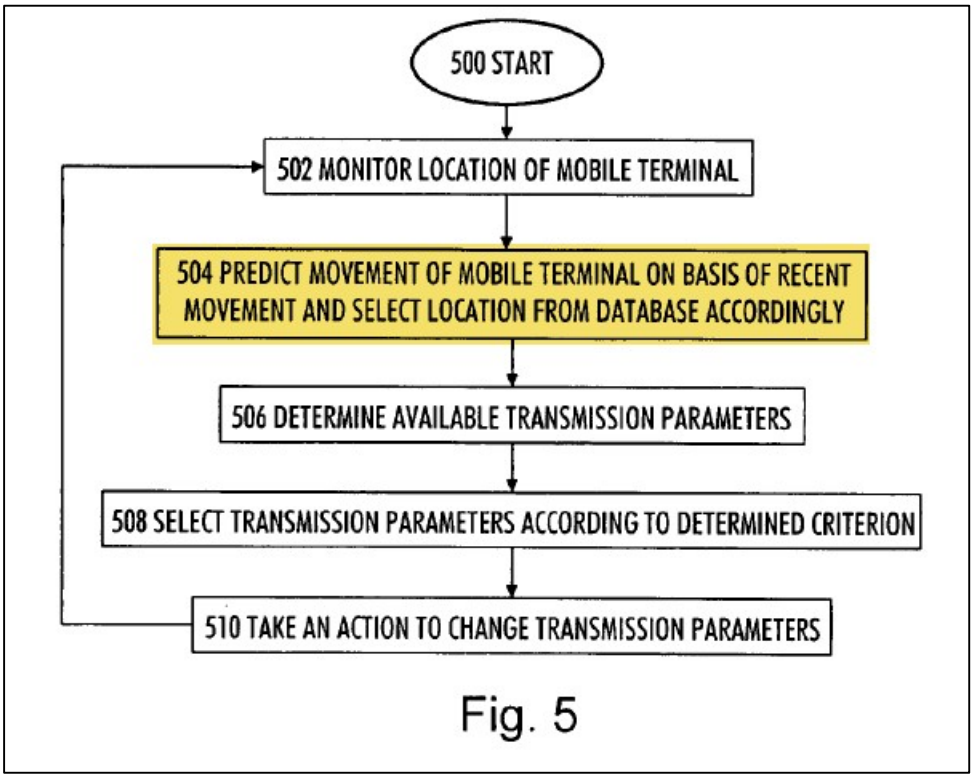


Fig. 5

(Jarvinen, Fig. 5; McClellan, ¶62. *See also* Jarvinen at ¶¶0048-66.)

After estimating the UE's future position, Jarvinen estimates the UE's future link quality at that estimated position based on information stored in the database. This is shown in Jarvinen's Claim 4, where a UE's future link quality is estimated by reviewing Transmission Property values stored in the database at the UE's predicted future location:

> 4. The method of claim 1, wherein the checking of the database further comprises
>
> > ***reading transmission property values*** linked to ***the geographical location associated with a predicted movement of the mobile terminal***,
> >
> > ***selecting one of the transmission property values*** according to the determined optimality criterion, and
> >
> > selecting transmission conditions ***linked to the selected transmission property value***.

(Jarvinen, cl. 4; McClellan, ¶63.)

Jarvinen explains that this Transmission Property-focused (i.e., link quality-focused) embodiment occurs when Transmission Conditions (i.e., transmission parameters) are selected "according to a determined criterion[,]" and that criterion is Transmission Properties. (*See* Jarvinen, ¶¶0051-52; McClellan, ¶64.) Jarvinen states that one would look to the Transmission Properties criterion "to obtain the highest possible reception signal level with the lowest possible transmit signal level." (Jarvinen, ¶0052; McClellan, ¶64.) When evaluating Transmission Conditions by the best possible Transmission Properties, "the transmission signal levels included in the available transmission condition groups may be compared with ***the reception signal levels included in the transmission property values***, and the transmission property group providing the highest ratio between the reception signal level and ***the transmission signal level may be selected***." (Jarvinen, ¶0052;

McClellan, ¶64. *See also* Jarvinen at ¶¶0053 ("The transmission condition group most suitable for the selected criterion may be ***selected in block 508*** by comparing ***the transmission property values*** of the transmission condition groups."), 0064 ("***the transmission property values*** associated with the predicted geographical location ***may be checked*** in block 506 and, if it is detected that none of the available transmission condition groups provide a sufficient transmission quality"), cls. 2, 22.)[9]

Limitation 24[d], like Limitation 24[c] discussed at Section VIII.A.6, refers to estimating the UE's "neighboring link qualities" at the UE's "neighboring positioning." (McClellan, ¶65.) As discussed above, these "neighboring" link qualities and positions are nearby link qualities and positions of the UE. (*See*

[9] As discussed in Section VIII.A.3, Jarvinen describes a UE performing the disclosed method instead of, or in addition to, the base station. (Jarvinen, cls. 21 ("a processing unit configured to check a database for ***transmission conditions of the communication link*** that are most optimal according to a determined optimality criterion for ***current movement of the mobile terminal***"), 22, 26 ("the processing unit is further configured to ***measure a communication link quality indicator***"), 38; McClellan, n.6. *See also* Jarvinen at ¶¶0048-52.)

Jarvinen, ¶0064; McClellan, ¶65.) In addition, Jarvinen's claim 4 describes a process of estimating one or more neighboring link qualities (LQs) of the UE at the at least one neighboring positioning of the UE based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE. (*See* Jarvinen, cl. 4; McClellan¶65.) For the reasons discussed in this Section VIII.A.7, Jarvinen meets Limitation 24[d]. (McClellan, ¶65.)

8. Limitations 1[d], 24[d], 33[d] and 34[d]: Obvious by Jarvinen in View of Fox Under 35 U.S.C. § 103

All of Limitations 1[d], 24[d], 33[d] and 34[d] are taught or suggested in Jarvinen in view of Fox. (McClellan, ¶66.)

a. Motivation to Combine Jarvinen and Fox

A POSITA would have been motivated to combine the teachings of Fox with Jarvinen. (McClellan, ¶69. *See also id.* at ¶¶74-76.) Jarvinen recognized the benefits of estimating a UE's link quality at a future location because doing so allowed one to "***select appropriate transmission conditions for a mobile terminal*** located in the geographical location" ahead of time. (Jarvinen, ¶0031 ("optimal transmission conditions may be selected ***before*** a change in the radio channel environment to prevent the degradation of signals."); McClellan, ¶69.) Knowing appropriate transmission conditions beforehand may mean that the "transmit power level of the mobile terminal may be lowered in order to save the battery . . . and/or a data rate

may be increased to provide a faster communication link between the mobile terminal and the base station[,]" or on the other hand, "the transmit power level may be increased and/or the data rate may be lowered" to maintain the connection between the UE and the base station. (Jarvinen, ¶0060; McClellan, ¶69.)

A POSITA faced with the problem of estimating a UE's future link quality at a location would have looked to Fox because Fox solves the problem of estimating future link quality with the exact same information available to Jarvinen. (McClellan, ¶70.) Specifically, both Jarvinen and Fox disclose measuring UEs' link qualities at locations, then storing those pieces of information together in a database. (*See* Sections VIII.A.3, VIII.A.4; Jarvinen, ¶¶0009, 0021, 0031, 0034-47, cls. 6-8, 26, 27, Figs. 3, 4; Fox, ¶¶0022, 0043, 0048, Figs. 15A, 15B; McClellan, ¶70.) Fox further discloses estimating a UE's link quality at a future location by referring to a previous link quality measurement taken at the same location. (Fox, ¶0022 (controller using "the record of radio quality across the coverage area and the calculated present location and velocity of one of the mobile terminals to ***estimate the radio conditions available to that mobile terminal at a future location***[.]"); McClellan, ¶70.) All of the data upon which Fox relies is already disclosed and linked together in Jarvinen's database, and it would have been obvious for a POSITA

to combine Fox's method of looking up previous link quality to estimate future link quality with Jarvinen's teachings. (McClellan, ¶70.)

And there are additional similarities between the references that would have motivated a POSITA to combine them. (McClellan, ¶71.) Both references are in the same technological field: wireless networking. (*Compare* Jarvinen, Abstract *with* Fox, Abstract; McClellan, ¶71.) Both references were seeking to solve the same problem: estimating a UE's future position and the link quality at that position. (*Compare* Jarvinen, ¶¶0035-66, Figs. 3, 5 *with* Fox, ¶¶0022, 0043, 0048, Figs. 15A, 15B; McClellan, ¶71.) Both references were seeking to solve this problem toward the same end: improving transmission conditions for the UE at the future position. (*Id*.) Both references refer to UMTS as an exemplary wireless networking technology. (*Compare* Jarvinen, ¶¶0042, 0043, 0057 *with* Fox, ¶¶0161, 0243; McClellan, ¶71.)

Moreover, modifying Jarvinen to perform Fox's link quality estimation would have constituted a simple substitution of a known element to yield predictable results. (McClellan, ¶72.) As discussed above, Jarvinen already stores all information necessary to perform Fox's estimation step. (*Id.* at ¶72.) Moreover, the estimation step is a simple one to implement because it would require only a simple database lookup: searching Jarvinen's database for the UE's future location in the

"Geographic Locations" column, then reading the "Transmission Properties" value associated with that location. (*Id.* at ¶72.) Using Fox's estimated link quality would have yielded predictable results because it would yield information already known in Jarvinen: the Transmission Properties (i.e., link quality) at a given location. (*Id.* at ¶72.) Jarvinen teaches storing the exact same link quality information as Fox. (*Compare* Jarvinen, ¶0034 ("The reception level of the signal may be a ***received signal strength indicator (RSSI)*** . . . another communication link quality indicator may be measured, such as a ***signal-to-interference power ratio***.") *with* Fox, ¶¶0043 ("The radio measurements may include ***received signal strength*** . . ."), 0048 ("The radio link quality measurements may include CQI, ACK/NACK ratios, BLER, Frame Errors Rates, BERs, Qual, ***RSSI***, RSCP . . . etc."), 0331 ("based on signal-to-noise ratio, ***signal-to-interference plus noise ratio (SINR)***, signal-to-noise plus distortion ratio (SNDR)"); McClellan, ¶72.)

It also would have been obvious to try estimating link quality at a future location based on previous link quality measurements at that same location. (McClellan, ¶73.) A POSITA could well assume that link quality measurements at a location may be largely static over time. (*Id.* at ¶73.) Link quality depends upon many factors, but some of those factors are unchanging: the location of mountains, trees, buildings as well as the base station itself. (*Id.* at ¶73.) Previous measurements

of link quality would be useful to a POSITA to estimate, the best they can, what link quality might be at that same location sometime in the future. (*Id.* at ¶73.) As a result, it would have been obvious for a POSITA to try modifying Jarvinen to include Fox's link quality estimation method. (*Id.* at ¶73.)

Additional, and more specific, reasons for combining these references are discussed below with respect to specific claim features.

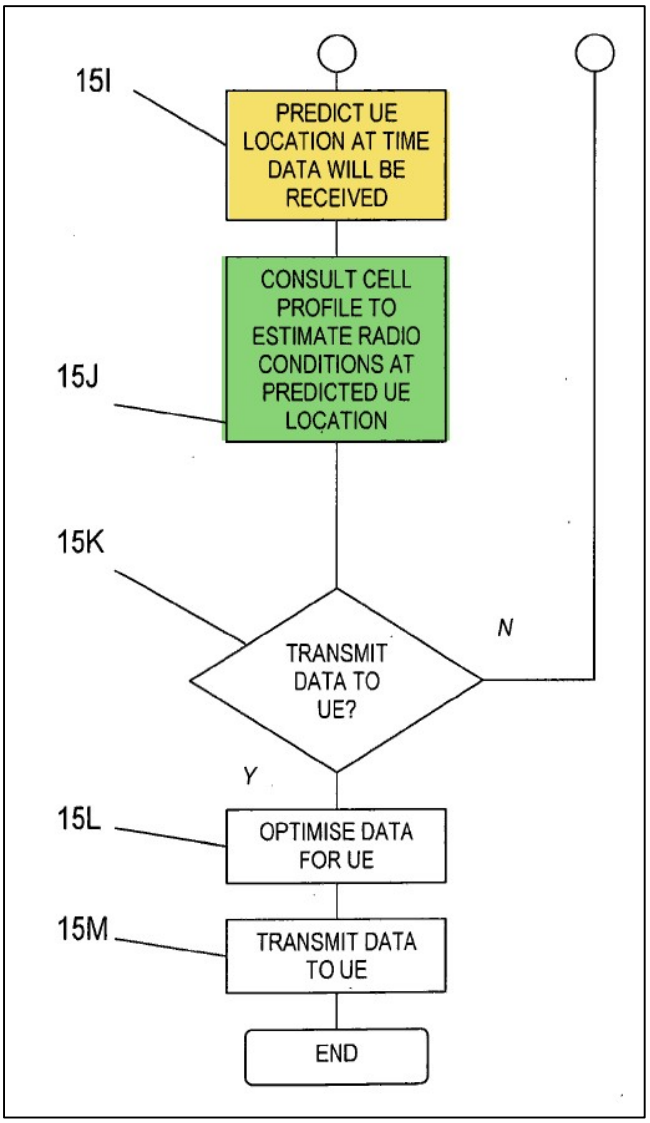
b. Jarvinen in View of Fox

A POSITA would have been motivated to combine Fox with Jarvinen for the reasons set forth in Section VIII.A.8.a. (*Id.* at ¶66.) Fox discloses estimating a future (or neighboring) link quality of a UE (or second UE) at a future (or neighboring) position based on stored information associated with the plurality of link qualities at the plurality of positionings of the UE. (*Id.* at ¶66.)

Fox's controller first collects a plurality of link qualities at a plurality of UE positions. (*See* Fox, ¶¶ 0043 ("The radio measurements may include received signal strength, transmit power levels, neighbour cell measurements."), 0048 ("The radio link quality measurements may include CQI, ACK/NACK ratios, BLER, Frame Errors Rates, BERs, Qqual, RSSI, RSCP . . . etc."); McClellan, ¶67.) The controller then stores this information along with the location where it measured the link quality in a database. (Fox, ¶0022 ("The controller may build and maintain ***a record***

of radio quality across a coverage area of the network . . . The record may be in the form of ***a map of the coverage area, indicating which areas of the coverage area provide which qualities of radio coverage***."); McClellan, ¶67.)

Later, the controller predicts the UE's future location, as shown in Figure 15B at Step 15I:



(Fox, ¶0367 ("At step 15I the processor 1244 predicts the location of mobile terminal 1200"), Fig. 15B; McClellan, ¶68.) In Step 15J, the controller uses "the record of radio quality across the coverage area and the calculated present location and velocity of one of the mobile terminals to ***estimate the radio conditions available to that mobile terminal at a future location***[.]" (Fox, ¶¶ 0022, 0368 ("At step 15J the cell map/profile from the store 1242 is consulted by the processor 1244 to retrieve data relating to the predicted future location of the mobile terminal."), Fig. 15B; McClellan, ¶68.)

9. Limitations 1[d], 24[d], 33[d] and 34[d]: Single-Reference Obviousness Under § 103

To the extent that the Board does not agree that Jarvinen meets Limitations 1[d], 24[d], 33[d] and 34[d], then Petitioners argue that Jarvinen renders those limitations obvious under 35 U.S.C. § 103. *Game & Tech. Co. v. Activision Blizzard Inc.*, 926 F.3d 1370, 1381 (Fed. Cir. 2019) ("[A] patent can be obvious in light of a single prior art reference if it would have been obvious to modify that reference to arrive at the patented invention."); *SIBIA Neurosciences, Inc. v. Cadus Pharmaceutical Corp.*, 225 F.3d 1349, 1356 (Fed. Cir. 2000) ("In appropriate circumstances, a single prior art reference can render a claim obvious."). It would have been obvious for a POSITA to modify Jarvinen to estimate link quality at a

given location in the future by evaluating the previously measured link quality at a given location (discussed at Sections VIII.A.7 and VIII.A.8). (McClellan, ¶77.)

This modification would be minimal because Jarvinen already assumes that the link quality previously measured and stored at a location will match the link quality at that location in the future. (McClellan, ¶78.) This assumption is at least implicit in Jarvinen because it discloses selecting Transmission Conditions based on Transmission Properties (i.e., link quality) measured at a given location in the past. (*See* Section VIII.A.7; Jarvinen, ¶¶0051-53 ("criterion may be to obtain the highest possible reception signal level with the lowest possible transmit signal level[,]" "the transmission signal levels included in the available transmission condition groups may be compared with ***the reception signal levels included in the transmission property values***[,]" "The transmission condition group most suitable for the selected criterion may be selected in block 508 by comparing ***the transmission property values*** of the transmission condition groups."), cl. 4 (***reading transmission property values*** linked to ***the geographical location associated with a predicted movement of the mobile terminal***, ***selecting one of the transmission property values*** according to the determined optimality criterion . . ."); McClellan, ¶78.) By selecting future Transmission Conditions at a future location based on previously measured

Transmission Properties at that location, Jarvinen is assuming that "past is prologue" with regard to link quality. (McClellan, ¶78.)

The '868 Patent likewise makes this same assumption, and uses previously stored link quality information at a UE's estimated future location to "estimate a future link quality." (*See* '868 Patent, 1:40-64 ("estimate a future link quality (LQ) of the UE at the at least one future positioning of the UE ***based on the stored information associated with the plurality of LQs at the plurality of positionings of the UE***."); McClellan, ¶79. *See also* '868 Patent, 24:46-54 (estimating different link qualities (830a, 830b) at different possible UE positions (860a, 860b)), 24:54-62 (estimating the UE's future link quality "based on the stored information associated with the plurality of LQs 803a, 830b at the plurality of positionings of the UE device 820.").)

And, like the '868 Patent, Jarvinen then acts on the assumption that the previously recorded link quality at a location would be a good estimate of the current link quality at that location. (Jarvinen, cl. 4 ("reading transmission property values linked to the geographical location associated with a predicted movement of the mobile terminal, ***selecting one of the transmission property values*** according to the determined optimality criterion . . ."); McClellan, ¶80.)

After estimating the UE's location, Jarvinen uses link quality to decide which of several Transmission Conditions to choose to best utilize the communications link when the UE arrives at that future location. (Jarvinen, cl. 1 ("taking action to change the transmission conditions of the communication link upon detecting, in the database, the transmission conditions providing a more optimal communication link"); McClellan, ¶81.) The '868 Patent likewise acts upon its estimation of future link quality to improve communications between base station and UE. ('868 Patent, 26:51-57 ("the BS obtains a plurality of estimated future LQs of the plurality of UE devices and the scheduler assigns transmit modes to each of the plurality of UE devices based on the plurality of estimated future LQs . . ."); McClellan, ¶81.)

Furthermore, Jarvinen explains that estimating future link quality in this manner is beneficial because it eliminates the need to remeasure link quality in real-time: "When provided with knowledge of data transmission properties (or quality measures of a communication link) obtainable with different transmission conditions from a given geographical location, one may select appropriate transmission conditions for a mobile terminal located in the geographical location or arriving shortly at the geographical location ***with no need to measure properties of the radio channel environment and react to the changing environment***." (Jarvinen, ¶0031;

McClellan, ¶82.) The '868 Patent likewise recognizes this benefit. (*See* '868 Patent, 25:27-32, 26:45-51, 27:24-46; McClellan, ¶82.)

In view of the above, it would have been obvious for a POSITA to modify Jarvinen to estimate a future link quality of the UE at the at least one future positioning by assuming that a previous link quality at a location will match a current link quality at that same location. (McClellan, ¶83. *See also id.* at ¶¶84-86.)

10. Claim 2:[10] The method of claim 1, wherein at least one of the future LQ or the plurality of LQs comprises one or more of a path loss (PL), shadowing (S), interference (I), signal to noise ratio (SNR), signal to interference and noise ratio (SINR), signal to interference ratio (SIR), channel quality indicator (CQI), channel state information (CQI), packet error rate (PER).

Jarvinen also discloses that the link qualities comprise at least path loss, shadowing, signal-to-interference ratio, packet error rate and channel quality indicator. (Jarvinen, ¶¶0002 ("The attenuation is typically caused by ***path loss***, ***shadowing***, and fading."), 0017 ("***Shadowing*** is superimposed on ***path loss***[.]"), 0034 ("The reception level of the signal may be a ***received signal strength indicator (RSSI)*** . . . another communication link quality indicator may be measured, such as

[10] For each dependent claim, Petitioners incorporate all argument above relating to those claims upon which the dependent claim depends.

a ***signal-to-interference power ratio***."), 0062 ("The ***communication quality indicator*** may be, for example, a measured reception power level of a signal received from the mobile terminal and/or from the base station."), 0067 ("the base station may monitor the ***communication quality indicator*** measured from signals received from the mobile terminal . . ."); McClellan, ¶87. *See also* Jarvinen at ¶¶0033 ("reception ***signal strengths*** or other ***communication quality metrics*** obtained from a plurality of geographical locations."), 0039, 0052, cl. 8 ("the measured communication link quality indicator is a measured level of the received signal").)

11. Claim 3: The method of claim 1, wherein at least one of the future LQ or the information associated with the plurality of LQs is associated with an uplink or downlink transmission.

Jarvinen also discloses that the future link quality information is associated with uplink and downlink transmissions. (Jarvinen, ¶¶0047 ("Naturally, the database may also be utilized in managing ***downlink transmission***."), 0072 ("Above, the utilization of the database in the selection of transmission conditions has been described for ***uplink transmission***, but it may be utilized in the same way for ***downlink transmission***."); McClellan, ¶88. *See also* Jarvinen at ¶¶0041, 0055, 0073.)

12. Claim 4: The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a frequency band or a frequency channel.

Jarvinen also discloses that the link qualities are associated with a frequency band or a frequency channel. (Jarvinen, ¶¶0041 ("The transmission conditions may include radio system parameters, such as the ***transmission frequency*** and a serving base station but also other conditions such as bearing of the mobile terminal and transmit power."), 0042 ("The ***transmission frequency*** is a parameter known to the base station from a transmission protocol."), 0061 ("The time window may be reset, i.e. the monitoring may be restarted, when the ***transmission frequency is changed, because the radio channel properties are dependent on the transmission frequency***, and monitoring over different frequencies would provide unreliable results."), 0072 ("For the downlink, the base station ***transmission frequency*** and the radio system may be changed[.]"), cls. 12, 31 ("the transmission conditions comprise at least one of the following: a transmission frequency . . ."). *See also* Jarvinen at ¶0055; McClellan, ¶89.)

13. Claim 5: The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a wireless communication technology.

Jarvinen also discloses that the link qualities are associated with a wireless communication technology. (Jarvinen, ¶¶0042 ("at least one of the following data

transmission standards: ***GSM (Global System for Mobile Communications), UMTS (Universal Mobile Telecommunication System) based on W-CDMA (Wideband Code Division Multiple Access) and/or OFDMA (Orthogonal Frequency Division Multiple Access) and SC-FDMA (Single Carrier Frequency Division Multiple Access), WLAN (Wireless Local Area Network)***."), 0043 ("The transmit power . . . may be tracked with a transmit power control procedure utilized in many mobile telecommunication systems, including ***UMTS***."); McClellan, ¶90.)

14. Claim 6: The method of claim 1, wherein at least one of the future LQ or the plurality of LQs is associated with a link partner of the UE.

Jarvinen also discloses that the link qualities are associated with a link partner of the UE (e.g., a base station). (Jarvinen, ¶¶0062 ("The communication quality indicator may be, for example, a measured reception power level of a signal received from the mobile terminal and/or from ***the base station***."), 0067 ("***the base station*** may monitor the communication quality indicator measured from signals received from the mobile terminal. . ."), 0073; McClellan, ¶91.)

15. Claim 7: The method of claim 1, wherein a link quality positioning information includes at least one of the determined plurality of LQs, the stored information, the estimated future positioning or the estimated future LQ.

As discussed above at Section VIII.A.3, Jarvinen also discloses that the link quality positioning information stored in its database includes at least one of the

determined plurality of link qualities ("Transmission Properties"), the stored information, the estimated future positioning ("Geographical Location") or the estimated future link quality ("Transmission Properties"). (*See* Jarvinen, ¶¶0034-36, Figs. 3, 4; McClellan, ¶92.)

16. Claim 8: The method of claim 7, wherein the UE obtains at least a portion of the link quality positioning information from a link partner or wherein the UE communicates the at least the portion of the link quality positioning information to the link partner.

Jarvinen also discloses that the UE obtains link quality positioning information from a link partner or the UE communicates link quality positioning information to the link partner. (McClellan, ¶93.) For example, Jarvinen discloses the UE and a link partner (e.g., base station) transmitting signal information to one another. (Jarvinen, ¶0034 ("Transmission of ***the signaling information related to the geographical information*** may be defined in a communication protocol used in the communication between the mobile terminal and ***the base station***."), 0067 ("Furthermore, the mobile terminal may monitor ***the communication quality indicator measured from a signal received from the base station***[.]"). *See also* Jarvinen at ¶¶0048, 0065, cls. 5, 25; McClellan, ¶93.) Jarvinen also discloses the base station and UE cooperatively communicating the link quality positioning

information with one another, depending on which of the two nodes maintains the database:

> [T]he database may be stored in a memory unit of the mobile terminal. The measurements may still be carried out by the base station ***but the base station may inform the mobile terminal of the measurement results***, and the mobile terminal may add the results (and other transmission property values), the transmission conditions, and the geographical location values to the database stored in the memory unit of the mobile terminal. Of course, the database may be stored in both the mobile terminal and the radio network.

(Jarvinen, ¶0045; McClellan, ¶93.)

17. Claim 9: The method of claim 7, further comprising determining a UE usage information, wherein at least a portion of the link quality positioning information is based on the UE usage information.

Jarvinen also discloses determining a UE usage information, wherein at least a portion of the link quality positioning information is based on the UE usage information – for example, monitoring the user's usage of a UE (e.g., on what bearing the UE is positioned) as part of evaluating link quality. (Jarvinen, ¶¶0017 ("a user of the mobile terminal may cause shadowing when talking on the phone such that the user's head is located between the mobile terminal and a base station[.]"), 0043 ("The bearing of the mobile terminal during the transmission may be determined by motion sensors or a compass provided in the mobile terminal. . . . the mobile terminal is able to determine its bearing with respect to the base station."), 0054, 0058 ("the mobile terminal may instruct the user of the mobile terminal to

change the bearing of the mobile terminal[.]"), cls. 12, 31; McClellan, ¶94.) Alternatively, Jarvinen teaches using the UE's location, which is based on usage, to determine and store link quality information. (*See* Section VIII.A.3; McClellan, ¶94.)

18. Claim 10: The method of claim 9, wherein the UE usage information comprises UE information indicating one or more of a user handheld mode, a hands-free mode, a speaker phone mode, a car Bluetooth mode, a headset Bluetooth mode.

Jarvinen explains that the system uses UE usage information to detect whether a UE is being used in handheld mode, and needs to be reoriented to establish a better link quality. (Jarvinen, ¶0058 ("***the mobile terminal may give instructions to turn the backside of the mobile terminal, i.e. the side opposite to a side typically pressed against the user's head during a phone call, towards the base station***."); McClellan, ¶95. *See also* Section VIII.A.3; Jarvinen, cls. 15, 35.) Jarvinen's disclosed system also determines whether a UE is being used in a car or hands-free mode. (Jarvinen, ¶0071 ("The radio system may profile the mobile terminals according to their speeds into fixed, pedestrian, and ***vehicular mobile terminals***, or according to their current location."); McClellan, ¶95.)

19. Claim 11: The method of claim 7, further comprising determining a UE environment information, wherein at least a portion of the link quality positioning information is based on the UE environment information.

Jarvinen also discloses determining UE environment information, wherein at least a portion of the link quality positioning information is based on the UE environment information. (Jarvinen, ¶¶0039 ("The database may be updated constantly with new data to adapt the database to ***changes in the radio environments*** related to different geographical locations. . . . The ***radio environment*** may have changed due to newly constructed buildings[.]"), 0062 ("Several factors may affect the actual transmission properties with given transmission conditions. Such factors include ***season of the year***, ***weather, traffic***, etc."); McClellan, ¶96. *See also* Jarvinen at ¶¶0058-59.)

20. Claim 12: The method of claim 11, wherein the UE environment information comprises information associated to one or more of a traffic load, a network load, an interference, time of day, whether [sic] information, day of year, season.

Jarvinen also discloses UE environment information that includes "season of the year, weather, traffic, etc." (Jarvinen, ¶0062; McClellan, ¶97.)

21. Claim 13: The method of claim 11, wherein the UE environment information comprises information associated with surrounding objects or information associated with a user of the UE.

Jarvinen also discloses UE environment information that includes "***changes in the radio environments*** related to different geographical locations. . . . The ***radio environment*** may have changed due to newly constructed buildings, for example." (Jarvinen, ¶0039; McClellan, ¶98.) As discussed in Section VIII.A.17, Jarvinen also discloses UE environment information associated with a user of the UE.

22. Claim 14: The method of claim 13, wherein the information associated with the user of the UE includes positioning of the user of the UE or positioning of the user of the UE relative to the UE.

As discussed in Sections VIII.A.3 and VIII.A.21, Jarvinen discloses environment information associated with the user's positioning relative to the UE. (McClellan, ¶99.)

23. Claim 15: The method of claim 11, further comprising assisting determining the UE environment information using sensors of the UE.

Jarvinen also discloses determining UE environment information using sensors of the UE. (Jarvinen, ¶¶0029 ("The positioning device 208 may be configured to monitor the geographical location of the mobile terminal in real time by communicating with one or more satellites of a satellite positioning system, such as ***GPS, assisted GPS (A-GPS), or Galileo***. Other alternatives for tracking the

location and the movement of the mobile terminal include providing ***motion sensors*** in the positioning device 208 . . .”), 0043 (“The bearing of the mobile terminal during the transmission may be determined by ***motion sensors or a compass*** provided in the mobile terminal.”), cls. 20, 38; McClellan, ¶100.)

24. Claim 16: The method of claim 1, further comprising allocating a resource to a UE link, wherein the allocation of the resource to the UE link is based on the estimated future LQ.

Jarvinen also discloses allocating a resource to a UE link, wherein the allocation of the resource to the UE link is based on the estimated future link quality. (Jarvinen, ¶¶0054 (changing transmission conditions, including “***transmission frequency***”), 0055 (“***a change of transmission frequency***.”). *See also id.* at ¶¶0005 (“taking action to ***change the transmission conditions of the communication link***”), 0006-9, 0072 (“***the base station transmission frequency and the radio system may be changed***”), 0078, Fig. 5 (Block 510 (“Take Action to Change Transmission Parameters”)), cls. 12, 13, 31, 32; McClellan, ¶101.)

25. Claim 17: The method of claim 1, further comprising selecting a transmission mode for a UE link, wherein the selecting the transmission mode for the UE link is based on the estimated future LQ.

Jarvinen also discloses selecting a transmission mode for a UE link, wherein the selecting the transmission mode for the UE link is based on the estimated future

link quality. (Jarvinen, ¶¶0005 ("taking action to ***change the transmission conditions of the communication link*** upon detecting, in the database, transmission conditions providing a more optimal communication link . . . "), 0054 ("action is taken in block 510 to change the transmission conditions of the mobile terminal to ones corresponding to the transmission condition group selected in block 508. . . . With respect to the exemplary ***transmission conditions listed above, i.e. transmission frequency, serving base station, transmit power, and bearing of the mobile terminal***, a change of each of these parameters will be described next."), 0060 ("The improvement in the radio channel may be utilized in a number of different ways. For example, a ***transmit power level of the mobile terminal may be lowered*** in order to save the battery and prolong the operational duration of the mobile terminal, and/***or a data rate may be increased*** to provide a faster communication link between the mobile terminal and the base station."), cls. 12, 13, 31, 32; McClellan, ¶102.)

26. Claim 18: The method of claim 17, wherein the transmission mode comprises one or more of a modulation, a code, a modulation and coding scheme (MCS), a multiple input multiple output (MIMO) mode, a beamforming parameter, a transmit power.

Jarvinen also discloses a transmission mode comprising modulation and coding scheme and transmit power. (Jarvinen, ¶¶0002 ("***Transmit power control*** is

a known scheme to combat all types of attenuation. ***Modulation and coding schemes*** may also be changed according to radio channel properties . . .”), 0041 (“The transmission conditions may include radio system parameters, such as the transmission frequency and a serving base station but also other conditions such as bearing of the mobile terminal and ***transmit power***.”), 0054 (“With respect to the exemplary transmission conditions listed above, i.e. transmission frequency, serving base station, ***transmit power***, and bearing of the mobile terminal, a change of each of these parameters will be described next.”), 0060 (“a ***transmit power*** level of the mobile terminal may be lowered in order to save the battery and prolong the operational duration of the mobile terminal[.]”); McClellan, ¶103.)

27. Claim 19: The method of claim 1, further comprising obtaining at least one future time, and wherein the estimating the at least one future positioning is based on the at least one future time.

As discussed above in Section VIII.A.5, Jarvinen discloses obtaining at least one future time, and wherein the estimating the at least one future positioning is based on the at least one future time. (*See* Jarvinen, cls. 2, 22; McClellan, ¶104.)

28. Claim 20: The method of claim 1, further comprising a second plurality of positionings wherein the second plurality of positionings comprises the at least one future positioning, and further comprising estimating a second plurality of LQs based on the second plurality of positionings.

As discussed above in Section VIII.A.3, Jarvinen's database includes positioning information related to more than one UE. (*See* Jarvinen, ¶0036; McClellan, ¶105.) Moreover, the method disclosed in Jarvinen may review several positionings stored in the database before making a determination. (Jarvinen, ¶0041 ("One or more of the above-mentioned transmission conditions may be stored in a transmission condition group of a transmission condition set associated with a given geographical location."); McClellan, ¶105.) Jarvinen therefore discloses a second plurality of positionings wherein the second plurality of positionings comprises the at least one future positioning, and further comprising estimating a second plurality of link qualities based on the second plurality of positionings. (McClellan, ¶105.)

29. Claim 21: The method of claim 20, further comprising allocating a resource block (RB) to a UE link based on the estimated second plurality of LQs.

Jarvinen discloses that "***radio resource management operations*** may be used together with the embodiments of the invention[,]" giving as an example, "management of the transmission conditions may be performed within the scope of available resources (for example available frequencies allocated to a base station)."

(Jarvinen, ¶0078; McClellan, ¶106.) These resource allocations include resource blocks.

a. Claim 21: Obvious by Jarvinen in View of Fox Under 35 U.S.C. § 103

Claim 21 is taught or suggested in Jarvinen in view of Fox. (McClellan, ¶107. *See also id*. at ¶¶108, 109.) A POSITA would have been motivated to combine Fox with Jarvinen for the reasons set forth in Section VIII.A.8.a. After estimating a UE's link quality at a future (or neighboring) location, Fox further discloses allocating a resource block (RB) to a UE link based on the estimated second plurality of link qualities because Fox allocates the most optimal radio resources, including resource blocks, to the UE based on its estimated link qualities. (Fox, ¶¶0022 (the controller can "control ***the transmission of data between the radio access network and that mobile terminal at the calculated location*** in dependence thereon."), 0566 ("The radio resource allocation may be defined for a type of application or user—the ***pre-allocated resource blocks*** or Codes, or Timeslots."), 0583 ("The radio resource allocation may be defined for a type of application or user, by allocating particular ***resource blocks***, codes or time slots."); McClellan, ¶107. *See also* Fox at ¶0578 ("Resource Blocks in LTE").)

b. Claim 21: Single-reference Obviousness Under § 103

To the extent that the Board does not agree that Jarvinen meets Claim 21, then Petitioners argue that Jarvinen renders this claim obvious under 35 U.S.C. § 103. *Game & Tech.*, 926 F.3d at 1381; *SIBIA Neurosciences*, 225 F.3d at 1356. Because a POSITA would understand that the resources available in a telecommunications network, which Jarvinen expressly references, would include resource blocks – or blocks of time on a frequency channel – it would have been obvious to modify Jarvinen to include "allocating a resource block (RB) to a UE link." (McClellan, ¶110. *See also id.* at ¶¶111, 112.)

30. Claim 22: The method of claim 1, wherein the plurality of positionings is constrained to a physical area.

Jarvinen also discloses the plurality of positionings being constrained to a physical area. (Jarvinen, ¶0050 ("The ***geographical location (a limited area)*** the mobile terminal will be entering next is predicted in block 504 . . ."), cls. 17, 36; McClellan, ¶113.)

31. Claim 23: The method of claim 1, wherein at least one of the plurality of positionings or the estimated at least one future positioning of the UE further comprises at least one of an error, an accuracy, a deformation, a velocity, an acceleration.

Jarvinen also discloses that the plurality of positionings or the estimated at least one future positioning of the UE further comprises at least one of an error, an

accuracy, a deformation, a velocity, an acceleration. (Jarvinen, ¶¶0029 ("Other alternatives for tracking the location and the movement of the mobile terminal include providing ***motion sensors*** in the positioning device 208 . . ."), 0050 ("The geographical location (a limited area) the mobile terminal will be entering next is predicted in block 504, for example, ***by extrapolating the latest movement of the mobile terminal***[.]"), 0071 ("A radio system may also give profiles to mobile terminals within a radio access network of the radio system ***on the basis of the movement of the mobile terminals***. The radio system may profile the mobile terminals ***according to their speeds*** into fixed, pedestrian, and vehicular mobile terminals[.]"); McClellan, ¶114.)

32. Claim 25: The method of claim 24, further comprising adjusting or changing a configuration of the UE based on the one or more neighboring LQs.

Jarvinen also discloses adjusting or changing a configuration of the UE based on the one or more neighboring link qualities. Block 510 of Figure 5 shows the UE changing its transmission parameters after evaluating neighboring link qualities at Blocks 504, 506 and 508:

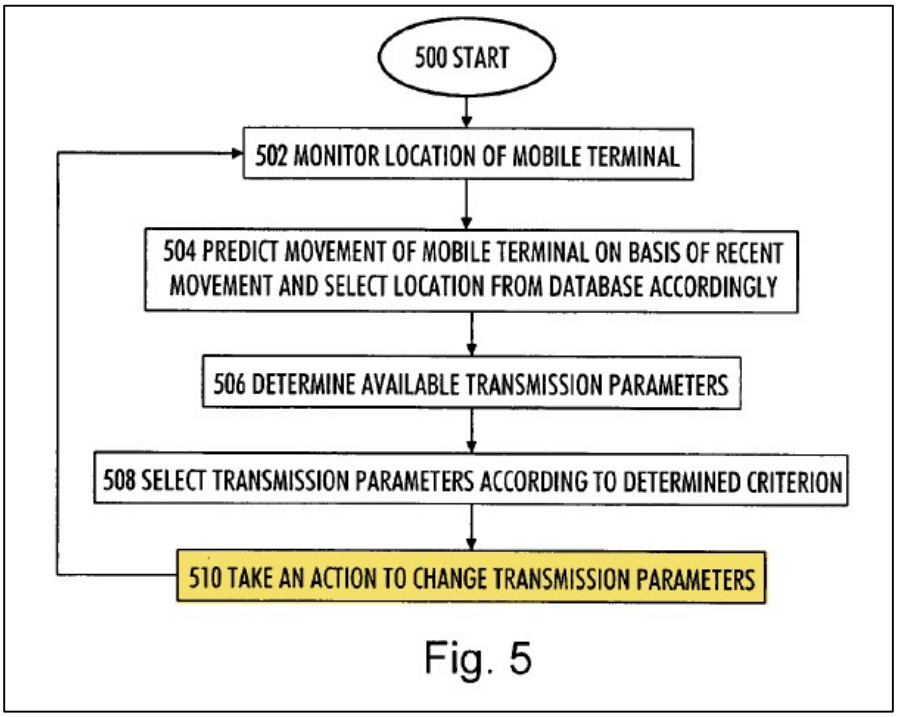


Fig. 5

(Jarvinen, Fig. 5, ¶¶0049-53, 0054 ("action is taken in block 510 to change the transmission conditions of the mobile terminal to ones corresponding to the transmission condition group selected in block 508"); McClellan, ¶115. *See also* Jarvinen at ¶¶0005-9, 0058-64, 0072, 0075, cls. 1, 2, 13, 14, 21, 22, 32-34, 36, 39, 40.)

33. Claim 26: The method of claim 24, further comprising presenting the one or more neighboring LQs of the UE at the at least one neighboring positioning.

Jarvinen also discloses presenting the one or more neighboring (i.e., nearby) link qualities of the UE at the at least one neighboring positioning by teaching that the user of the UE could be presented with an alternative bearing for the UE to improve link quality. (Jarvinen, ¶¶0058 ("If the current bearing of the mobile

terminal differs from that indicated in the selected transmission condition group, ***the mobile terminal may instruct the user of the mobile terminal to change the bearing*** of the mobile terminal towards the base station of a radio system indicated in the transmission condition group selected in block 508."), 0059 ("The instructions on changing the bearing of the mobile terminal may be ***provided through the user interface of the mobile terminal***."); McClellan, ¶116. *See also* Jarvinen at ¶¶0005-9, 0049-54, 0058-64, 0072, 0075, Fig. 5, cls. 14, 15, 33, 34.)

34. Claim 27: The method of claim 24, further comprising selecting a candidate positioning from the at least one neighboring positioning based on the one or more neighboring LQs.

Jarvinen also discloses selecting a candidate positioning from the at least one neighboring positioning based on the one or more neighboring link qualities. (McClellan, ¶117.) As discussed in Section VIII.A.33 and shown in Figure 5, Jarvinen discloses selecting a position from its database:

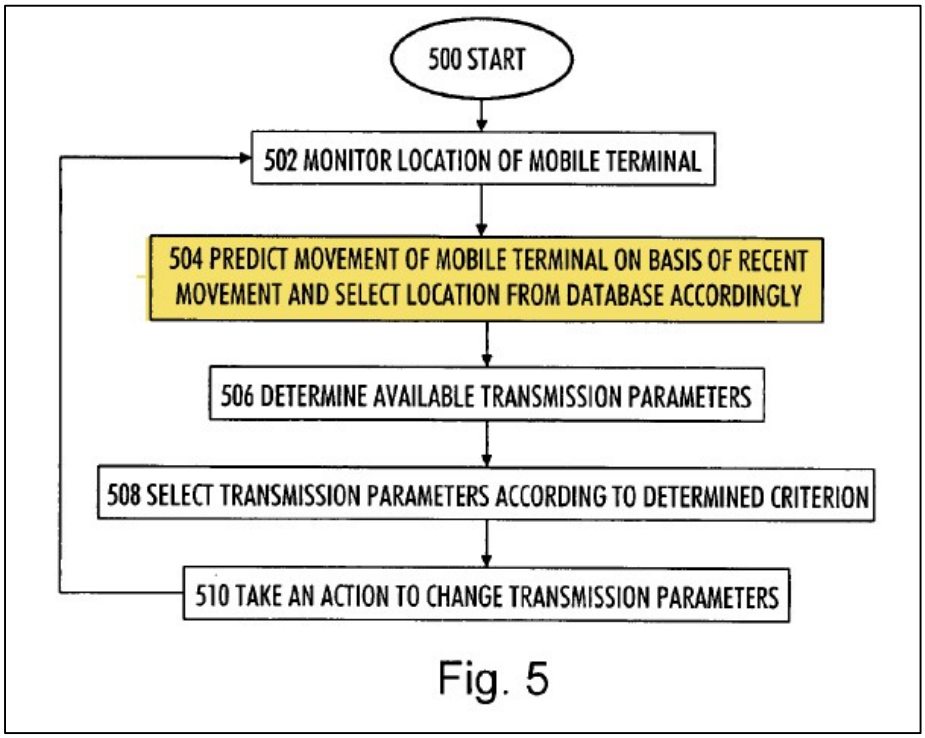


Fig. 5

(Jarvinen, Fig. 5.) This position is one of several neighboring positions where link quality would be best, and Jarvinen discloses instructing the user to move to such a position. (Jarvinen, ¶0058 ("the mobile terminal may instruct the user of the mobile terminal to change the bearing of the mobile terminal towards the base station of a radio system indicated in the transmission condition group selected in block 508."); McClellan, ¶117. *See also* Jarvinen at ¶0059, Fig. 5, cls. 14, 15, 33, 34.)

35. Claim 28: The method of claim 27, further comprising presenting the selected candidate positioning to a user of the UE.

As discussed in Section VIII.A.33, Jarvinen also discloses presenting the selected candidate positioning to a user of the UE. (McClellan, ¶118.)

36. Claim 29: The method of claim 24, wherein a link quality neighboring positioning information includes at least one of the determined plurality of LQs, the stored information, the estimated at least a positioning of the UE, the determined at least one neighboring positioning, or the one or more neighboring LQs.

As discussed in Sections VIII.A.3-VIII.A.5, Jarvinen also discloses a link quality neighboring positioning information that includes at least one of the determined plurality of link qualities, the stored information, the estimated at least a positioning of the UE, the determined at least one neighboring positioning, or the one or more neighboring link qualities. (McClellan, ¶119.)

37. Claim 30: The method of claim 29, further comprising determining a UE environment information, wherein at least a portion of the link quality neighboring positioning information is based on the UE environment information.

As discussed in Section VIII.A.19, Jarvinen also discloses determining UE environment information, wherein at least a portion of the link quality neighboring positioning information is based on the UE environment information. (McClellan, ¶120.)

38. Claim 31: The method of claim 30, the UE environment information comprises information associated with a user of the UE.

As discussed in Section VIII.A.21, Jarvinen also discloses the UE environment information comprises information associated with a user of the UE. (McClellan, ¶121.)

39. Claim 32: The method of claim 30, further comprising selecting a joint candidate positioning of the UE and a user of the UE, wherein the joint candidate positioning comprises a combination of a UE positioning and a user positioning relative to the UE.

As discussed in Sections VIII.A.3, VIII.A.17 and VIII.A.21, Jarvinen discloses selecting a joint candidate positioning of the UE and a user of the UE, wherein the joint candidate positioning comprises a combination of a UE positioning (e.g., geographic location) and a user positioning relative to the UE (e.g., bearing). (McClellan, ¶122.)

IX. THE BOARD SHOULD NOT EXERCISE ITS DISCRETION TO DENY INSTITUTION

A. The Board Should Not Deny Review Under 35 U.S.C. § 325(d)

Neither of the references relied upon herein were substantively evaluated in the ’868 Patent prosecution history, nor are the references substantially the same as the reference substantively evaluated during prosecution. (*See* Ex. 1002, 168-83.) Under the *Advanced Bionics* two-part framework outlined below, such references may be relied upon in an IPR. *See Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8 (PTAB Feb. 13, 2020) (precedential). Accordingly, the Board should not exercise its discretion under Section 325(d).

1. Whether the Same or Substantially the Same Art Previously Was Presented to the Office or Whether the Same or Substantially the Same Arguments Previously Were Presented to the Office

Petitioners acknowledge that Jarvinen was cited in an IDS. (*See* Ex. 1002, 168-83.) Fox, however, was not before the Examiner. ('868 Patent, 1-2 ("References Cited").) Fox is not the same or substantially the same as Kennedy, the single reference that the Examiner substantively evaluated – nor does Fox have any priority relationship or share inventorship with Kennedy. (*See* Fox, 1; Ex. 1011, 1.) The *Advanced Bionics* inquiry thus ends with respect to Fox.

2. If Either Condition of the First Part of the Framework is Satisfied, Whether the Petitioner has Demonstrated that the Office Erred in a Manner Material to the Patentability of the Challenged Claims

With respect to Jarvinen, the '868 Patent's file history and this Petition demonstrate that it was a material error for the Office to overlook Jarvinen. *Advanced Bionics* explained that the *Becton, Dickinson* factors provide "useful insight" into how to analyze this part of the inquiry. *See Advanced Bionics*, IPR2019-01469, Paper 6 at 9. Among those non-exclusive factors are "(c) the extent to which the asserted art was evaluated during examination, including whether the prior art was the basis for rejection;" and "(f) the extent to which additional evidence and facts presented in the petition warrant reconsideration of the prior art or

arguments." *Becton, Dickinson and Co. v. B. Braun Melsungen AG*, IPR2017-01586, Paper 8 at 17–18 (PTAB Dec. 15, 2017) (precedential as to § III.C.5, first paragraph).

Here, both factors weigh heavily against discretionary denial. Jarvinen was cited in a sea of 70 total references. (Ex. 1002, 125-38.) Additionally, the Examiner did not substantively evaluate Jarvinen either in a rejection or the Reasons for Allowance section of the allowance, and only summarily initialed the bottom of the pages of the IDS, as opposed to individually initialing each reference. (*See id.* at 168-83.) The Examiner only addressed Kennedy, a reference found by the Examiner and not cited within the same IDS as Jarvinen. (*Id.*) *See Scientific Design Co. v. Shell Oil Co.*, IPR2021-01537, Paper 7 at 25 (P.T.A.B. Mar. 18, 2022) ("[W]e credit Petitioner's argument that, although the references 'were cited in a December 5, 2007 IDS, together with 91 references, none of them was used in any rejections, or otherwise addressed by the examiner[.]'") Furthermore, based on the strength of this Petition, which includes expert testimony not before the Examiner that attests to the scope and content of Jarvinen, reconsideration of Jarvinen is also warranted under factor (f). *See Advanced Energy Industries v. Reno Technologies*, IPR2021-01397, Paper 7 at 7 (Feb. 16, 2022); *Scientific Design*, IPR2021-01537, Paper 7 at 25.

B. The Board Should Not Deny Review under 35 U.S.C. § 314(a)

In view of the Director's recent guidance on *Fintiv*, the time to trial is not a dominating factor in the *Fintiv* analysis. *Memorandum for the Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation*, at 8 (June 21, 2022). Instead, a "compelling unpatentability challenge" is a more important consideration. *Id*. at 4. Such compelling evidence refers to a high likelihood of success on the merits for at least one claim. *Commscope Tech. LLC v. Dali Wireless, Inc*., IPR2022-01242, Paper 23 at 3-4 (PTAB Feb. 27, 2023) (precedental). *See also Align Technology, Inc. v. 3Shape A/S*, IPR2020-01087, Paper 15 at 42-43 (PTAB Jan. 20, 2021) ("Strong merits typically favor granting institution."). For the reasons set forth above in Section VIII, this case presents a compelling unpatentability challenge.

Should Patent Owner present a *Fintiv* challenge based on developments in the District Court Litigation[11] after the filing of this Petition, Petitioner will seek to address those developments.

---

[11] That litigation is just beginning, and thus the *Fintiv* factors favor institution. The District Court has set "estimated" trial dates for September 8, 2025 (Ex. 1007, 1)

X. CONCLUSION

Petitioners have presented evidence that the subject matter of Claims 1-34 of the '868 Patent was known in the art prior to the '868 Patent's priority date. Therefore, there is a reasonable likelihood that Petitioners will prevail as to each of these claims. *Inter partes* review of Claims 1-34 is therefore respectfully requested.

---

and September 22, 2025 (Ex. 1006, 1.). (*See* Ex. 1008, 35 (the median time frame from filing to trial of a civil litigation at the Eastern District of Texas is 21.6 months).)

Dated: September 20, 2024

Respectfully submitted,

Holland & Knight LLP

/s/ Jacob K. Baron
Jacob K. Baron
Reg. No. 48,961

XI. MANDATORY NOTICES (37 C.F.R. § 42.8(b))

A. Real Parties In Interest (37 C.F.R. § 42.8(b)(1))

Petitioners T-Mobile, AT&T, Verizon, Ericsson and Nokia are real parties-in-interest ("RPIs"). In an abundance of caution, only for purposes of this proceeding, and only to the extent that Patent Owner contends that they should be named an RPI, Petitioners also identify the following entities as potential RPIs without conceding that they would satisfy the factually intensive RPI test: Sprint LLC, AT&T Mobility LLC, AT&T Enterprises LLC,[12] Verizon Corporate Services Group Inc. and Telefonaktiebolaget LM Ericsson. In addition, some of the entities listed above out of an abundance of caution are holding companies that are legally and factually distinct from their subsidiaries (that may also be listed above and which maintain their own independent corporate status, identity, and structure) and have not provided any products or services that might be at issue in the underlying patent infringement lawsuit.

[12] Related-Matter Defendant AT&T Corp. has undergone a corporate transaction and is now merged and converted into AT&T Enterprises, LLC.

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

The '868 Patent is asserted in the following co-pending litigations, all of which are in the District Court for the Eastern District of Texas:[13]

Case Caption	Case No.
Headwater Partners II LLC v. Verizon Wireless et al.	2:24-cv-00007-JRG-RSP
Headwater Partners II LLC v. T-Mobile USA, Inc. et al.	2:24-cv-00015-JRG-RSP
Headwater Partners II LLC v. AT&T Corp. et al.	2:24-cv-00016-JRG-RSP

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

Lead counsel: Jacob K. Baron (Reg. No. 48,961; Jacob.Baron@hklaw.com).

Backup counsel: Jacob W. S. Schneider (*pro hac vice* motion forthcoming; Jacob.Schneider@hklaw.com).

The mailing address for all PTAB correspondence is Holland & Knight LLP, 10 St. James Ave., 11th Floor, Boston, MA 02116.

[13] Ericsson and Nokia were not sued, but later joined as intervenor-defendants in the district court litigations against AT&T, Verizon and T-Mobile. (Exs. 1009, 1010.)

D. Service Information (37 C.F.R. § 42.8(b)(4))

Please address all correspondence to lead counsel at the address above. Petitioners consent to electronic service at: Jacob.Baron@hklaw.com and ClientTeamHeadwaterLitigation@hklaw.com.

E. Fee for *Inter Partes* Review

The Director is authorized to charge the fee specified by 37 CFR § 42.15(a) to Deposit Account No. 50-2324.

XII. CERTIFICATE OF SERVICE

The undersigned certifies that a complete copy of this Petition for *Inter Partes* Review of U.S. Patent No. 9,094,868 and all Exhibits and other documents filed together with this Petition were served on the official correspondence address for U.S. Patent No. 9,094,868 shown in Patent Center and Headwater Partners II LLC's current litigation counsel:

James Harris
Headwater Partners II LLC
110 North College Avenue
Suite 1116
Tyler, TX 75702

Marc Fenster
CA State Bar No. 181067
Email: mfenster@raklaw.com
Reza Mirzaie
CA State Bar No. 246953
Email: rmirzaie@raklaw.com

Brian Ledahl
CA State Bar No. 186579
Email: bledahl@raklaw.com
Ben Wang
CA State Bar No. 228712
Email: bwang@raklaw.com
Adam Hoffman
CA State Bar No. 218740
Email: ahoffman@raklaw.com
Dale Chang
CA State Bar No. 248657
Email: dchang@raklaw.com
Paul Kroeger
CA State Bar No. 229074
Email: pkroeger@raklaw.com
Neil A. Rubin
CA State Bar No. 250761
Email: nrubin@raklaw.com
Kristopher Davis
CA State Bar No. 329627
Email: kdavis@raklaw.com
James S. Tsuei
CA State Bar No. 285530
Email: jtsuei@raklaw.com
Philip Wang
CA State Bar No. 262239
Email: pwang@raklaw.com
Amy Hayden
CA State Bar No. 287026
Email: ahayden@raklaw.com
James Milkey
CA State Bar No. 281283
Email: jmilkey@raklaw.com
Qi Peter Tong
TX State Bar No. 24119042
Email: ptong@raklaw.com

James Pickens
CA State Bar No. 307474
Email: jpickens@raklaw.com
Jason M. Wietholter
CA State Bar No. 337139
Email: jwietholter@raklaw.com
RUSS AUGUST & KABAT
12424 Wilshire Blvd. 12th Floor
Los Angeles, CA 90025
Telephone: 310-826-7474
headwater@raklaw.com

ATTORNEYS FOR,
Headwater Partners II, LLC

via FEDERAL EXPRESS overnight delivery, on September 20, 2024.

Dated: September 20, 2024

/s/ Jacob K. Baron

Jacob K. Baron (Reg. No. 48,961)
jacob.baron@hklaw.com
HOLLAND & KNIGHT LLP
10 Saint James Avenue; 11th Floor
Boston, MA 02116
Telephone: (617)523-2700
Facsimile: (617)523-6850

Counsel for T-Mobile USA, Inc., AT&T Services, Inc., Cellco Partnership d/b/a Verizon Wireless, Ericsson Inc. and Nokia of America Corporation

XIII. CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24

I hereby certify that this Petition complies with the word count limitation of 37 C.F.R. § 42.24(a)(1)(i) because the Petition contains 13,131 words, excluding the cover page and the parts of the Petition exempted by 37 C.F.R. § 42.24(a)(1).

Dated: September 20, 2024

/s/ Jacob K. Baron

Jacob K. Baron (Reg. No. 48,961)
jacob.baron@hklaw.com
HOLLAND & KNIGHT LLP
10 Saint James Avenue; 11th Floor
Boston, MA 02116
Telephone: (617)523-2700
Facsimile: (617)523-6850

Counsel for T-Mobile USA, Inc., AT&T Services, Inc., Cellco Partnership d/b/a Verizon Wireless, Ericsson Inc. and Nokia of America Corporation