(12) **INTER PARTES REVIEW CERTIFICATE** (3417th)
United States Patent
Jorguseski et al.

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(45) **Certificate Issued: Feb. 8, 2024**

(54) **METHOD AND SYSTEM FOR AUTOMATIC COVERAGE ASSESSMENT FOR COOPERATING WIRELESS ACCESS NETWORKS**

(71) Applicants: **Ljupco Jorguseski; Remco Litjens; Haibin Zhang; Adrian Victor Pais**

(72) Inventors: **Ljupco Jorguseski; Remco Litjens; Haibin Zhang; Adrian Victor Pais**

(73) Assignee: **KONINKLIJKE KPN N.V.**

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Inter Partes Review Certificate for:

Patent No.: **RE48,089**
Issued: **Jul. 7, 2020**
Appl. No.: **16/224,047**
Filed: **Dec. 18, 2018**

The results of IPR2022-00079 are reflected in this inter partes review certificate under 35 U.S.C. 318(b).

AS A RESULT OF THE INTER PARTES REVIEW PROCEEDING, IT HAS BEEN DETERMINED THAT:

Claims **1-5**, **11** and **13-15** are cancelled.

* * * * *

NOTE: This order is nonprecedential.

United States Court of Appeals for the Federal Circuit

KONINKLIJKE KPN N.V.,
Appellant

v.

ERICSSON, INC.,
Appellee

2023-2217

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2022-00079.

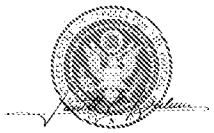
O R D E R

The parties having so agreed, it is ordered that:

(1) The proceeding is DISMISSED under Fed. R. App. P. 42 (b).

(2) Each side shall bear their own costs.

FOR THE COURT



January 24, 2024
Date

Jarrett B. Perlow
Clerk of Court

ISSUED AS A MANDATE: January 24, 2024

Trials@uspto.gov
571-272-7822

Paper 29
Date: May 23, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ERICSSON INC.,
Petitioner,

v.

KONINKLIJKE KPN N.V.,
Patent Owner.

IPR2022-00079
Patent RE48,089

Before KEVIN F. TURNER, NORMAN H. BEAMER, and RUSSELL E. CASS, *Administrative Patent Judges.*

CASS, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

A. *Background*

In this *inter partes* review, Ericsson Inc. ("Petitioner") challenges the patentability of claims 1–5, 11, and 13–15 (the "challenged claims") of U.S. Patent No. RE48,089 (Ex. 1001, "the '089 patent"), which is assigned to Koninklijke KPN N.V. ("Patent Owner").

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a), addresses issues and arguments raised during the trial in this *inter partes* review. For the reasons discussed below, Petitioner has proven by a preponderance of the evidence that claims 1–5, 11, and 13–15 are unpatentable.

B. *Procedural History*

In this proceeding, Petitioner relies upon the following references:

> Olofsson, WO Pub. No. 2010/034157 A1, published Apr. 1, 2010 (Ex. 1006); and
>
> Kuruvilla, US 2009/0181664 A1, published Jul. 16, 2009 (Ex. 1007).

Pet. v, 22–91.

Petitioner submits declarations from Dr. Michael Kotzin (Exs. 1003, 1036). Patent Owner submits a declaration from Dr. Radostin Pachamanov (Ex. 2008).

Petitioner challenges the patentability of claims 1–5, 11, and 13–15 of the '089 patent based on the following ground:

Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1–5, 11, and 13–15	103(a)[1]	Olofsson, Kuruvilla

Pet. ii, 22. Patent Owner filed a Preliminary Response. Paper 6 ("Prelim. Resp."). We instituted trial on all grounds of unpatentability. Paper 9 ("Inst. Dec."), 49.

During the trial, Patent Owner filed a Response (Paper 13, "PO Resp."), Petitioner filed a Reply (Paper 18, "Pet. Reply"), and Patent Owner filed a Sur-reply (Paper 22, "PO Sur-reply").

An oral hearing was held on March 7, 2023, a transcript of which appears in the record. Paper 28 ("Tr.").

C. Real Parties in Interest

Petitioner states that the real parties in interest are Ericsson Inc. and Telefonaktiebolaget LM Ericsson. Pet. 1. Patent Owner states that Koninklijke KPN N.V. is the real party in interest. Paper 3, 2.

D. Related Proceedings

The parties state that the '089 patent was asserted in *Koninklijke KPN NV v. Telefonaktiebolaget LM Ericsson*, Case No. 2-21-cv-00113 (E.D. Tex.) (the "Texas litigation"), which was filed on March 31, 2021. Pet. 1–2; Paper 3, 2.

E. The '089 Patent (Ex. 1001)

The '089 patent is directed to "a method and system for assessing coverage in a wireless access network." Ex. 1001, code (57). The

[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), included revisions to 35 U.S.C. §§ 103 and 112 that became effective after the filing of the application that led to the '089 patent. Therefore, we apply the pre-AIA versions of 35 U.S.C. §§ 103 and 112.

background of the '089 patent explains that "[i]n order to provide adequate service to the clients, wireless operators constantly evaluate the coverage area of their wireless access networks." *Id.* at 1:34–36. This evaluation can be performed using "drive tests," which consist of measurement routes that are traversed by a measurement terminal often mounted on a vehicle. *Id.* at 1:46–51. The '089 patent explains that these drive tests have several drawbacks, including that they provide coverage assessment only along the measurement route, and are too costly for estimation of overall coverage. *Id.* at 1:67–2:3.

According to the '089 patent, the invention seeks to overcome these drawbacks by providing a system that uses "terminals capable of measurement and reporting across the different wireless access networks." Ex. 1001, code (57). An example of such a system is disclosed in Figure 3, reproduced below.

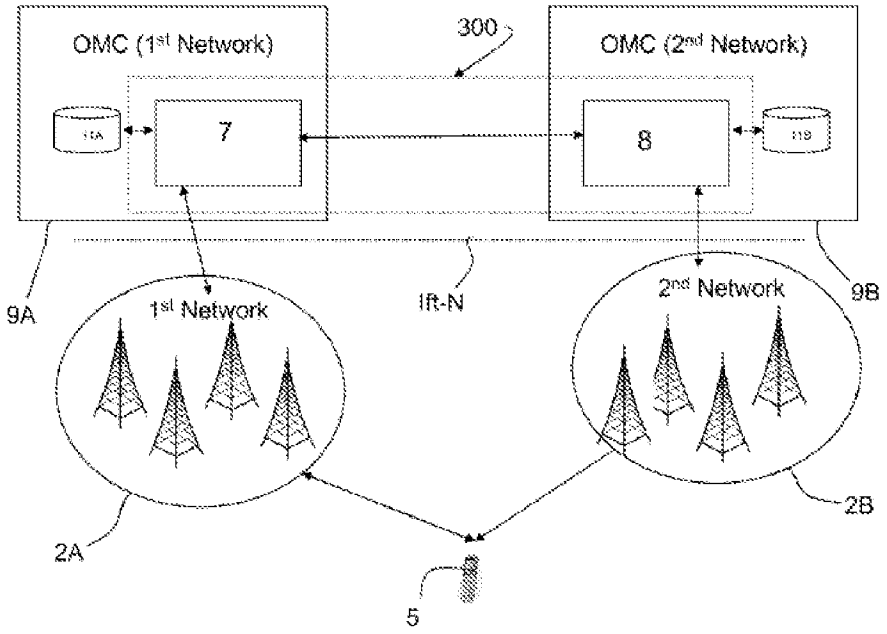


FIG. 3

Figure 3 shows a coverage assessment system according to one embodiment of the invention of the '089 patent. Ex. 1001, Fig. 3, 6:18–20.

Figure 3 depicts coverage assessment system 300, including information collector 7 and coverage estimator 8. Ex. 1001, 7:10–14. Information collector 7 "is configured for collecting information from some of the terminals 5 via the first wireless access network 2A and providing the information to the coverage estimator 8." *Id.* at 7:14–17. Coverage estimator 8 "is configured for connecting to and receiving information from the information collector and, based on the received information, generating the coverage assessment for the second wireless access network 2B." *Id.* at 7:17–21. In the embodiment shown in Figure 3, "information collector 7 is included within an [operation and maintenance center (]OMC[)] 9A of the first wireless access network 2A and the coverage estimator 8 is included within OMC 9B of the second wireless access network 2B." *Id.* at 7:22–26. "Alternatively," the '089 patent explains, "the first and second wireless access networks 2A, 2B may share the same OMC." *Id.* at 7:26–27.

The '089 patent explains that information collector 7 and coverage estimator 8 "may be largely implemented as software executed by a processor and making use of memory," but may also "be implemented in hardware or a combination of software and hardware." Ex. 1001, 7:28–34.

A flow diagram of method steps for generating the coverage assessment is shown in Figure 4, reproduced below.

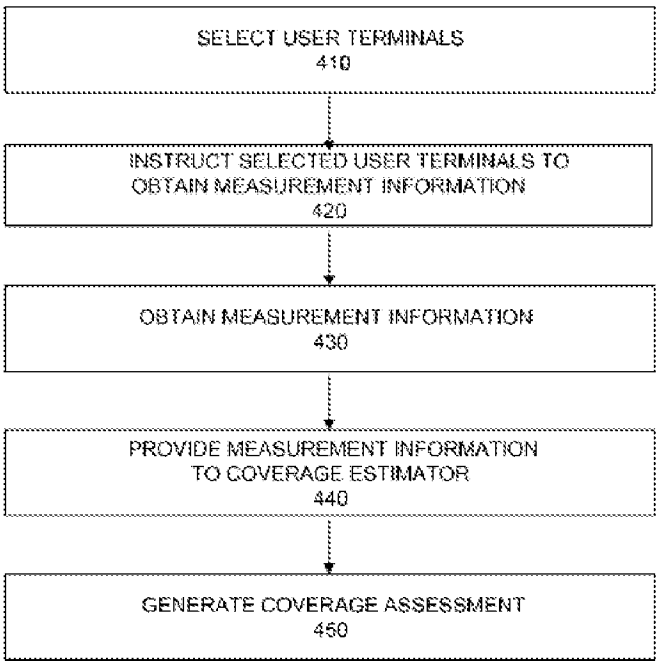


FIG. 4

Figure 4 is a flow diagram of method steps for generating a coverage assessment for a wireless access network. Ex. 1001, Fig. 4, 6:21–25.

In step 410, "information collector 7 selects one or more of the terminals 5 for obtaining measurement information." Ex. 1001, 8:34–36. In step 420, "information collector 7 instructs the selected one or more terminals [from the first network] to measure signals from the [second] network." *Id.* at 8:66–9:1. In step 430, "information collector 7 obtains measurement information indicative of the signals measured from the [second] network by the selected one or more terminals." *Id.* at 9:1–4. In step 440, "information collector 7 forwards the measurement information obtained from the selected terminals to the coverage estimator 8 within the [second] network." *Id.* at 9:62–65. Finally, in step 450, "coverage estimator 8 generates the coverage assessment for the [second] network based on the information obtained from the information collector." *Id.* at 10:11–13. The coverage assessment "is generated by assembling a coverage map,

representing the geographic locations/pixels with associated signal strengths of the second network." *Id.* at 10:13–16.

F. Illustrative Claims

Of challenged claims 1–5, 11, and 13–15, claims 1, 11, 13, and 15 are independent. For purposes of the issues raised in this proceeding, claim 1 is illustrative and is reproduced below.

> 1. [preamble] An automatic coverage assessment system configured for generating a coverage assessment for a second wireless access network of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals, the system comprising:
>
> 1[a] an information collector; and
>
> 1[b] a coverage estimator;
>
> 1[a][i] wherein the information collector is configured to: (i) select one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network,
>
> 1[a][ii] (ii) instruct the selected one or more terminals to measure signals from the second wireless access network;
>
> 1[a][iii] (iii) obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals, and
>
> 1[a][iv] (iv) provide the measurement information to the coverage estimator, and
>
> 1[b][i] wherein the coverage estimator is configured to: (i) obtain measurement information from the information collector, and

> 1[b][ii] (ii) based on the obtained measurement information, generate the coverage assessment for the second wireless access network of the telecommunications infrastructure.

Ex. 1001, 11:44–12:6 (bracketed paragraph identifiers added).

II. DISCUSSION

A. Claim Construction

A claim "shall be 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) (2020).

1. "Coverage Assessment"

Petitioner proposes that the term "coverage assessment" be construed, "consistent with the specification's definition," to mean "a 'representation of locations/pixels and associated signal strengths.'" Pet. 16 (citing Ex. 1001, 5:20–22). Patent Owner does not dispute this definition in its Patent Owner Response. PO Resp. 12–21. We agree that Petitioner's proposed construction of "coverage assessment" is consistent with how that term is used in the '089 patent specification. *See* Ex. 1001, 5:20–22 (referring to "the coverage assessment (i.e., a representation of locations/pixels and e.g. associated signal strengths of the second wireless access network)"). Accordingly, we apply Petitioner's construction of "coverage assessment" in this Decision.

2. Preambles – "first and second wireless networks capable of providing services to a plurality of terminals"

Patent Owner argues that the language in the preambles reciting "first and second wireless networks capable of providing services to a plurality of terminals" is limiting and should be construed to require "a system, mobile user terminal, or network node for a telecommunications infrastructure

comprising first and second wireless access networks, ***which are both operational and capable of providing services to a plurality of terminals***." PO Resp. 12 (emphasis added). First, Patent Owner asserts, this claim phrase is limiting because it "serves as an antecedent basis for claim elements," noting that the independent claims "refer to the 'first wireless access network' and 'second wireless access network,' which refer to the use of those terms in the preambles of those claims." *Id.* at 12–13 (citing Ex. 1001, 11:56–57; 13:33–34; 14:33–34; 14:66–67).

Second, Patent Owner contends that this claim language "is a necessary and defining aspect of the invention" because at least a portion of the mobile terminals can communicate with both networks. PO Resp. 13 (internal quotation marks omitted). According to Patent Owner, the '089 patent specification "explains that the invention is applicable in 'areas where several wireless access networks are cooperating, for example in terms of inter-RAT [(radio access technology)] handover and/or cell reselection,' which implies that both wireless access systems are operational, and importantly, that they are both open for 'providing services' to mobile subscribers" because "mechanisms such as 'handover' or 'cell reselection' are supported only if mobile terminals can switch service from one network to another." *Id.* (citing Ex. 1001, 6:45–48; Ex. 2008 ¶ 42).

Petitioner disagrees. Pet. Reply 1–3. First, Petitioner argues that the preamble is not limiting because it "merely states the invention's purpose, and thus does not limit the claims' scope." *Id.* at 1. Petitioner also responds to Patent Owner's argument that the disputed phrase in the preamble provides antecedent basis for elements in the body of the claim by contending that "[t]he body of the claim does not refer back to the 'capable

of providing services' clause on which [Patent Owner] bases its proposed construction." *Id.*

Second, Petitioner argues that even if the preamble is limiting, Patent Owner "fails to justify importing the requirement that the networks be commercially 'operational,' thereby excluding embodiments that are capable of providing services but [not] yet fully deployed." Pet. Reply 2. Petitioner asserts that the preamble recites only that the networks be "capable of providing services to terminals," which Patent Owner's expert testified that one of ordinary skill "would have understood to mean 'available to provide service,' 'possible to connect' to the network,' or 'have the ability to connect' to the network." *Id.* (citing Ex. 1034, 37:3–39:2). Petitioner also argues that the portions of the specification upon which Patent Owner relies as disclosing operational networks (Ex. 1001, 6:40–48) "expressly clarif[y] that the patent is '*not limited to*' such example networks." Pet. Reply 2. (citing Ex. 1001, 6:45). Petitioner further contends that Patent Owner's construction "reads out express embodiments of the second network that include emerging or not-yet-deployed networks," such as an LTE network that may be "at the beginning of the LTE deployment." *Id.* (citing Ex. 1001, 7:59–65). Finally, Petitioner argues that the '089 patent also describes evaluating coverage for networks "currently 'out of coverage' by the prior art solutions." *Id.* at 2–3 (citing Ex. 1001, 3:58–61).

Patent Owner responds that the phrase "not limited to" in column 6, line 45 of the '089 patent specification upon which Petitioner relies "refers to the ***areas of cooperation***, not to the ***type of networks***." PO Sur-reply 5–6. Patent Owner also argues that the '089 patent specification's statement that the second network may be an LTE network "at the beginning of the LTE

deployment" refers "to the gradual commercial roll-out of LTE networks, during which, when partially deployed, the newly commercially operational LTE may have patchy service that can be assessed by the '089 [p]atent system." *Id.* at 7 (citing Ex. 1001, 7:59–65; Ex. 2008 ¶ 42). According to Patent Owner, "with a newly commercially operational LTE network, just as with other networks when using the '089 [p]atent system, the claim preambles require that both first and second networks are 'capable of providing services.'" *Id.* (citing Ex. 2008 ¶ 42).

We do not agree with Patent Owner that the phrase "first and second wireless networks capable of providing services to a plurality of terminals" should be construed to mean that the networks "are both ***operational*** and capable of providing services to a plurality of terminals." PO Resp. 12 (emphasis added). First, nothing in the claim language itself suggests that the networks must be "operational" as well as being "capable of providing services to a plurality of terminals." Second, we disagree that reading in the term "operational" is justified by the language in the '089 patent specification stating that the invention is applicable "in areas where several wireless access networks are cooperating, for example in terms of inter-RAT handover and/or cell reselection." *Id.* at 13 (citing Ex. 1001, 6:45–48). This portion of the specification expressly states that the invention is "not limited to" such applications, indicating that they should not be read into the claims where (as here) they are not recited. Ex. 1001, 6:45.

Moreover, we find that adding "operational" into the construction of the claim language would only serve to add ambiguity to the scope of the claim. Neither Patent Owner nor the '089 patent explains what is meant by an "operational" network, or how a network that is "operational" differs

from one that is "capable of providing services to a plurality of terminals." Therefore, we decline to add the requirement that the networks be "operational" into the claim language, as Patent Owner contends, and conclude that no further interpretation of the preamble language is necessary.

As further discussed below with respect to claim 1, we find that the combination of Olofsson and Kuruvilla teaches first and second wireless networks "capable of providing services to a plurality of terminals," as set forth in the preamble. *See* § II.D.4(a), *infra*. Therefore, we need not determine whether this language in the preamble is limiting for purposes of this Decision.

3. "Means-Plus-Function" Limitations

Claims 11, 13, and 15 include a number of limitations that recite "means for" followed by a function, and Petitioner argues that Section 112, paragraph 6 applies to these limitations. Pet. 16–22. Petitioner also argues that claim 1 recites "that the 'information collector' and 'coverage estimator' are 'configured to' or 'carr[y] out operations' to perform certain recited functionality, without reciting sufficient structure for performing those functions." *Id.* at 17 (alteration in original). Petitioner further asserts that the terms "information collector" and "coverage estimator" are nonce terms subject to Section 112, paragraph 6. *Id.* (citing *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015)). Accordingly, Petitioner argues, these limitations of claim 1 also invoke Section 112, paragraph 6. *Id.* In its Preliminary Response, Patent Owner did not address the issue of whether these claim elements invoke Section 112, paragraph 6. Prelim. Resp. 17–25.

In our Institution Decision, we applied Petitioner's proposed identification of structure and function under Section 112, paragraph 6 for the "means for" claim elements as well as for the terms "information collector" and "coverage estimator," consistent with the district court's claim construction order in the Texas litigation, which found that these claim elements invoke Section 112, paragraph 6. Inst. Dec. 17 (citing Ex. 1027, 33–35, 49).

Petitioner's identifications of function and structure for the various claim elements that it interprets under Section 112, paragraph 6, are discussed below.

Selecting, Associating and Generating Limitations

Limitations	Structure and Function
13[a] "means for selecting one or more terminals . . . second wireless access network;" Limitations 1[a][i][2], 11[d][i], 15[c][i].	Function: select one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network Structure: processor implementing an algorithm to select one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless

[2] As discussed further in Section II.A.4 below, the "information collector" includes the corresponding structure for all of the functions recited in limitations 1[a][i]–1[a][iv].

	access network
4[a] "information collector is further configured to associate the location information with at least one of the selected one or more terminals"	Function: associate the location information with at least one of the selected one or more terminals Structure: processor implementing an algorithm that associates the location information with at least one of the selected one or more terminals
15[b] "means for generating the coverage assessment . . . measurement information" Limitations 1[b][ii][3], 11[f][ii], 13[e].	Function: generate the coverage assessment for the second wireless access network of the telecommunications infrastructure based on the obtained measurement information Structure: processor implementing an algorithm that generates the coverage assessment for the second wireless access network of the telecommunications infrastructure

Pet. 17–18. Petitioner asserts that the '089 patent "describes information collector 7 as generic 'software executed by a processor and making use of memory,' 'hardware or in a combination of software and hardware,' which would include one or more processors implementing an algorithm to perform these respective functionalities." *Id.* at 18 (citing Ex. 1003 ¶ 78; Ex. 1001, 7:29–35).

[3] As discussed further in Section II.A.5 below, the "coverage estimator" includes the corresponding structure for the functions recited in limitations 1[b][i]–1[b][ii].

Instructing and Obtaining Limitations

Limitations	Structure and Function
13[b] "means for instructing the selected one or more terminals to measure signals from the second wireless access network" Limitations 1[a][ii], 11[d][ii], 15[c][ii].	Function: instruct the selected one or more terminals to measure signals from the second wireless access network Structure: interface of the first wireless access network that instructs the selected one or more terminals to measure signals from the second wireless access network
13[c] "means for obtaining measurement information . . . selected one or more terminals" Limitations 1[a][iii], 11[d][iii], 15[c][iii]	Function: obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals Structure: interface of the first wireless access network over which measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals are received
[3] "information collector is further configured to obtain location information . . . one or more terminals"	Function: obtain location information for at least one of the at least part of the plurality of terminals prior to selecting the one or more terminals Structure: interface of the first wireless access network over which location information for at least one of the at least part of the plurality of terminals is received

Pet. 18–19. Petitioner asserts that the '089 patent "consistently describes the generic information collector as communicating with terminals over the first wireless access network to instruct and obtain measurement information that the terminals collect from the second wireless access network." *Id.* at 19–20 (citing Ex. 1001, 2:25–36, 7:10–17, 9:16–19, 9:20–39). Petitioner further states that "[a]n interface of the first wireless access network performs the information collector's instructing and obtaining functionality." *Id.* at 20 (citing Ex. 1003 ¶ 79; Ex. 1001, 4:14–59, 6:1–3, 7:10–17, 7:59–61, 8:7–25, 8:65–9:19, Fig. 3).

Providing and Obtaining Limitations

Limitations	Structure and Function
13[d] "means for providing the measurement information to a coverage estimator" Limitations 1[a][iv], 11[d][iv], 15[c][iv].	Function: provide the measurement information to the [coverage estimator/network node] Structure: interface to the communication link that carries information to the [coverage estimator/ network node]
4[b] "information collector is further configured to . . . provide the location information . . . to the coverage estimator."	Function: provide the location information associated with the at least one of the selected one or more terminals to the coverage estimator Structure: interface to the communication link that carries the location information associated with the at least one of the selected one or more terminals to the coverage estimator
[5] "information collector is further configured to provide location information valid upon	Function: provide location information valid upon obtaining the measurement information for at

obtaining . . . one or more terminals."	least one of the selected one or more terminals Structure: interface to the communication link that carries location information valid upon obtaining the measurement information for at least one of the selected one or more terminals
15[a] "means for obtaining measurement information from an information collector" Limitations 1[b][i], 11[f][i].	Function: obtain measurement information from the information collector Structure: interface to the communication link that carries measurement information from the information collector

Pet. 20–21. Petitioner asserts that "[a]n interface to the communication link that carries information performs the claimed providing and obtaining functions." *Id.* at 21 (citing Ex. 1003 ¶ 80; Ex. 1001, 6:56–7:9, 7:23–28, 9:1–39, Fig. 3 (depicting generic communication link between information collector 7 and coverage estimator 8)).

Claim 11 Means-Plus-Function Terms

Limitations	Structure and Function
11[a] "means for measuring signals from the second wireless access network"	Function: measuring signals from the second wireless access network Structure: radio receiver of terminal 5 that measures signals from the second wireless access network
11[b] "means for providing . . . measured signals"	Function: providing the measurement information to at least one of an information collector or a coverage estimator based on the measured signals

	Structure: interface of terminal 5 to the first wireless access network over which measurement information based on the measured signals are sent

Pet. 21–22. Petitioner asserts that the '089 patent "identifies only terminal 5 with no internal components disclosed other than a radio terminal." *Id.* at 22 (citing Ex. 1001, 4:20–25, 6:39–44, 7:55–59, 7:65–67). Petitioner also argues that "[t]erminal 5 is therefore a radio terminal, and a radio receiver of terminal 5 performs the claimed measuring functionality." *Id.* (citing Ex. 1003 ¶ 82; Ex. 1015, 8). According to Petitioner, the "[i]nterface of terminal 5 to the first wireless access network therefore performs the claimed providing functionality." *Id.* (citing Ex. 1003 ¶ 82; Ex. 1001, 2:25–36, 6:1–12, 9:1–19, Fig. 3).

In our Institution Decision we found that Petitioner had set forth an adequate identification of the functions performed by the alleged means-plus-function elements as well as sufficient structure in the specification for purposes of institution. Inst. Dec. 22. Following our Institution Decision, neither party disputed or provided further argument on our determinations. PO Resp. 12–21; Pet. Reply 1–5; PO Sur-reply 5–11; *see also* Tr. 22:20–23:6, 25:24–26:1. We continue to find that these determinations are appropriate and apply them for purposes of this Decision.[4]

[4] We have considered the district court's claim construction order filed on March 16, 2022, which considers the construction of the terms "information collector" and "coverage estimator." *See* Ex. 1027 (district court claim construction order). Although the district court similarly found the terms to be governed by § 112 ¶ 6, certain of the district court's identifications of structure and function differ (or at least use different language) from those we have adopted here. *Id.* at 27–46. For example, the district court defined

4. "Information Collector"

In its Preliminary Response, Patent Owner argued that the term "information collector" must be construed to be "a ***distinct entity*** from the 'terminals'" and "must be configured to perform all four of the following actions: 'select one or more terminals,' 'instruct the selected one or more terminals,' 'obtain measurement information . . . measured . . . by the selected one or more terminals,' and 'provide the measurement information to the coverage estimator.'" Prelim. Resp. 17–18 (alterations in original).

In our Institution Decision, we agreed with Patent Owner that the plain language of claim 1 expressly requires the "information collector" to perform the four actions identified by Patent Owner. Inst. Dec. 16 (citing Ex. 1001, 11:53–66). We also preliminarily determined that the claims recite an "information collector" that is distinct from the "terminals," but did not require that it be a "distinct entity." *Id.* (citing Ex. 1001, 11:49–50 (reciting "a plurality of terminals"), 11:51 (reciting "an information collector"), 11:53–54 (reciting that the "information collector" is configured to "select one or more terminals")).

In its Patent Owner Response, Patent Owner continues to argue that the "information collector" must be a "distinct entity" from the terminals and must perform the four actions identified above. PO Resp. 14–16.

In its Reply, Petitioner does not contest that the "information collector" performs these four functions, or that the "information collector"

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the corresponding structure of the information collector's "select[ing]" function as "information collector 7 having the features and configurations disclosed in the '089 Patent; and equivalents." Ex. 1027, 36. However, the identifications of structure and function proposed by Petitioner here are undisputed in this proceeding, and we find them to be appropriate, as discussed above.

is distinct from the terminals. Pet. Reply 3. However, Petitioner asserts that "importing 'distinct entity' into the claims, as [Patent Owner] proposes, is unnecessary, without basis, and injects ambiguity." *Id.* (citing PO Resp. 15). According to Petitioner, "[n]either the claims nor the specification recite 'distinct entity.'" *Id.*

Petitioner also argues that Patent Owner's application of its construction appears to propose, in effect, that the "information collector" must be a "distinct network element" that is not met by "one or more components" of a network. Pet. Reply at 3–4. Petitioner disagrees with such a construction, arguing that the '089 patent specification does not require that the information collector be a "distinct network element," and in fact contradicts any such understanding by disclosing that "the 'coverage assessment system' of which the 'information collector' and 'coverage estimator' are a part may be decentralized." *Id.* (citing Ex. 1001, 7:3–7). "Moreover," Petitioner argues, "there is nothing precluding a 'network' from performing the role of the claimed 'information collector' as opposed to some distinct element within that network." *Id.* at 4. Petitioner further asserts that claim 14 of the '089 patent contradicts Patent Owner's proposed construction by expressly reciting "that the coverage estimator and the § 112(6) limitations corresponding to the information collector reside in the *same* network node," suggesting that such a limitation should not be required in independent claim 13 upon which claim 14 depends. *Id.* at 3.

We continue to agree with the construction in our Institution Decision that the "information collector" must perform the four actions identified by Patent Owner and recited in the claims: "select one or more terminals," "instruct the selected one or more terminals," "obtain measurement

information . . . measured . . . by the selected one or more terminals," and "provide the measurement information to the coverage estimator." Inst. Dec. 15–16 (alterations in original). We also maintain our construction that the "information collector" must be distinct from the "terminals." *Id.* However, we disagree with the portion of Patent Owner's construction requiring the "information collector" to be a "distinct entity." Nothing in the claim language requires that the "information collector" be a "distinct entity" and, as Petitioner points out, dependent claim 14 suggests otherwise by adding a specific limitation that the "coverage estimator" be "included within the network node" that performs the functions of the information collector. Ex. 1001, 11:44–12:6, 14:25–50.

Patent Owner's "distinct entity" requirement is also at odds with the '089 patent specification's disclosure that the "coverage assessment system" may "be decentralized by implementing coverage assessment functionality in other network elements." Ex. 1001, 7:4–6. As Dr. Pachamanov testified, "decentralized" means "that certain functions can be performed by *different* elements." Ex. 1034, 17:1–4 (emphasis added). The '089 patent also describes the "information collector" as being "largely implemented as software executed by a processor and making use of memory" or being "implemented in hardware or in a combination of software and hardware," indicating that the implementation of the "information collector" is flexible and can take many forms. Ex. 1001, 7:29–35. Additionally, the implementation in Figure 3 showing information collector 7 and coverage estimator 8 as separate boxes residing in different networks is described as "an example" according "to one embodiment of the present invention," indicating that the invention is not limited to this embodiment. *Id.* at 7:10–

12. Consequently, we do not construe the claim language to require that the "information collector" is a "distinct entity."

5. "Coverage Estimator"

Patent Owner argues that the claimed "coverage estimator" in element 1[b] "must be configured to 'obtain measurement information from the information collector,' where the information collector is of the type construed above, which is *distinct* from the *terminals*." PO Resp. 16–17. Petitioner does not contest that the "coverage estimator" is configured to obtain measurement information from the information collector, or that the "coverage estimator" is distinct from the terminals. Pet. Reply 3–4. Consequently, we construe the claims to require that the "coverage estimator" obtain measurement information from the information collector and be distinct from the terminals.

6. Dependent Claims 3, 4, and 5

Claims 3–5 recite as follows:

> 3. The automatic coverage assessment system of claim 1, wherein the information collector is further configured to obtain location information for at least one of the at least part of the plurality of terminals prior to selecting the one or more terminals.
>
> 4. The automatic coverage assessment system of claim 3, wherein the information collector is further configured to associate the location information with at least one of the selected one or more terminals and provide the location information associated with the at least one of the selected one or more terminals to the coverage estimator.
>
> 5. The automatic coverage assessment system of claim 1, wherein the information collector is further configured to provide location information valid upon obtaining the measurement information for at least one of the selected one or more terminals.

Ex. 1001, 12:11–26.

Patent Owner argues that "the location information 'prior to selecting the one or more terminals' in Claim 3 (and its dependent Claim 4) must be different from the 'location information valid upon obtaining the measurement information' in Claim 5'" because "Claim 5 is a separate dependent claim from Claim 3, which implies that it must relate to different subject matter." PO Resp. 17–18. "Otherwise," according to Patent Owner, claim 5 "would be duplicative and would contravene the general canon that no two claims in a patent should be interpreted as having the same scope." *Id.* at 18. Patent Owner also argues that this understanding is consistent with the '089 patent specification's disclosure that "the location of the selected terminals when they actually perform the measurement may have changed compared to the initial location that was used when the respective terminal was selected to participate in the measurement." *Id.* (citing Ex. 1001, 9:20–29). "Therefore," Patent Owner contends, "the location information in Claims 3 and 4 must relate to location information 'prior to selecting the one or more terminals,' which is different from the location information in Claim 5, which must relate to location information 'valid upon obtaining the measurement information.'" *Id.* (citing Ex. 2008 ¶ 46).

Petitioner disagrees, arguing that Patent Owner "fails to provide any basis in the specification or prosecution history for construing 'location information' differently across the different claims." Pet. Reply 4. According to Petitioner, there is no basis to limit the claims to situations where "the UE changes location between selection and measurement," and Patent Owner "reads out embodiments where it is the same 'location

information' because the UE did *not* change location between selection and measurement." *Id.* at 4–5 (citing PO Resp. 18).

Based on the full trial record, we find that "location information" in claims 3–5 should be given its ordinary meaning of information indicating the location of a terminal, and does not require further construction for purposes of this Decision. For each of claims 3–5, the other language in the claim provides context on how the "location information" is obtained and used in that claim. For example, in claim 3, the surrounding claim language requires that the "location information" is obtained "prior to selecting the one or more terminals," and claim 4 adds that this location information is "associate[d] . . . with" the selected terminal(s) and "provide[d] . . . to the coverage estimator." Ex. 1001, 12:11–21. Claim 5 is not dependent on claims 3 or 4, and the surrounding claim language states that the "location information" provided by the information collector is "valid upon obtaining the measurement information" for the terminal(s)—indicating that the location information is valid at the time the measurement information is obtained. *Id.* at 12:22–26; *see id.* at 9:20–29. Therefore, we agree with Patent Owner that claims 3 and 4 require that the "location information" is obtained "prior to selecting the one or more terminals," and claim 5 requires that the location information is "valid upon obtaining the measurement information," but disagree that this requires any specialized construction of the term "location information" beyond its ordinary meaning.

7. Other Terms

We determine that it is not necessary to provide an express interpretation of any other claim terms to resolve the issues presented in this proceeding. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*,

868 F.3d 1013, 1017 (Fed. Cir. 2017); *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) ("[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.").

B. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103(a) if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, objective evidence of non-obviousness.[5] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also "determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Whether a combination of prior art elements would have produced a predictable result weighs in the ultimate determination of obviousness. *Id.* at 416–417.

In an *inter partes* review, the petitioner must show with particularity why each challenged claim is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); 37 C.F.R. § 42.104(b) (2020). The burden of persuasion never shifts to Patent Owner. *Dynamic*

[5] Patent Owner has not presented objective evidence of non-obviousness.

Drinkware, LLC v. Nat'l Graphics, Inc., 800 F.3d 1375, 1378 (Fed. Cir. 2015).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

C. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art at the time of the alleged invention "would be a person with a B.S. degree in electrical engineering, computer engineering, or equivalent training or job experience, with at least one to two years of experience in wireless communication technology, or a Master's degree in electrical engineering, computer engineering, or other equivalent degree." Pet. 11 (citing Ex. 1003 ¶ 65). Petitioner further states that "[a]dditional education could compensate for less practical experience and vice versa." *Id.* Patent Owner does not propose a level of ordinary skill in the art. *See* PO Resp.

For purposes of this Decision, we adopt Petitioner's assessment of the level of ordinary skill in the art because we find it to be supported by the '089 patent and the asserted prior art.

D. Ground 1: Asserted Obviousness of Claims 1–5, 11, and 13–15 Based on Olofsson in view of Kuruvilla

Petitioner contends that claims 1–5, 11, and 13–15 would have been obvious over Olofsson in view of Kuruvilla. Pet. 22–91. Patent Owner disagrees, arguing that Petitioner has failed to establish that the prior art teaches or suggests various elements of the claims. PO Resp. 21–48.

1. Overview of Olofsson (Ex. 1006)

Olofsson is directed to a system for "triggering of a user equipment to perform test or measurement of a target network from an originating

network." Ex. 1006, code (57). Olofsson explains that field tests of cellular networks typically "are accomplished with drive tests wherein an RF or cellular engineer drives a vehicle around in a designated area while making one or more telephone calls using his mobile cellular telephone." *Id.* at 3:19–22. However, Olofsson explains, drive tests are "an extremely inefficient exercise, in terms of time, for an RF engineer." *Id.* at 4:10–12. Olofsson also explains that "[p]rior to open[ing] a communications system for public use and commercial services, most providers or operators would like to estimate their service quality and radio coverage provided." *Id.* at 5:2–4. Thus, according to Olofsson, "it would be of a great value to a wireless services provider, and in the end also to users of the services, if user equipment in public use could provide measurement data" for new networks using developing technology so that "coverage and service quality can be ensured prior to the new technology [being] made available for public services." *Id.* at 5:14–17.

To address this perceived need, Olofsson discloses a system including an originating network open for public use, a target network not yet open for public use, and user equipment devices (UEs) connected to the originating network that may be controlled to assist in testing of neighboring cells of the target network. Ex. 1006, 8:21–26. In Olofsson's system, an originating cell of the originating network informs selected UEs to measure a target cell. *Id.* at 9:9–12. In a densely populated area, the originating network preferably selects a subset of the available UEs to participate in the measurement. *Id.* at 10:20–22. The selection process can also consider the UE's capability for performing and reporting measurements and the UE's location. *Id.* at 10:3–6, 10.

The network signaling to the UE preferably includes information on what signals or parameters to measure or determine, and can include measurements for determining service quality and radio coverage. Ex. 1006, 12:24–27. UEs participating in the test measure signals of the new cell and send a report on the outcome of the measurement. *Id.* at 9:21–23. Olofsson discloses that measurement reports are preferably transmitted to a test evaluation server (TES) in the target cell. *Id.* at 14:18–21. However, Olofsson explains, measurement reports may also be transmitted to the originating cell, although doing so will require additional network signaling and communications that may drain the batteries of the UE. *Id.* at 14:23–26.

2. Overview of Kuruvilla (Ex. 1007)

Kuruvilla is directed to a system for identifying geographical areas where radio frequency coverage is poor. Ex. 1007, code (57). Kuruvilla explains that one "method of measuring RF coverage is to perform a drive test," but that this approach is "insufficient" because it requires technicians to physically visit multiple areas, it cannot achieve full coverage, and it does not reflect changing RF coverage due to construction and seasonal foliage. *Id.* ¶ 5. To overcome this problem, Kuruvilla provides a communication network that uses mobile units to make measurements, an embodiment of which is shown in Figure 1, reproduced below.

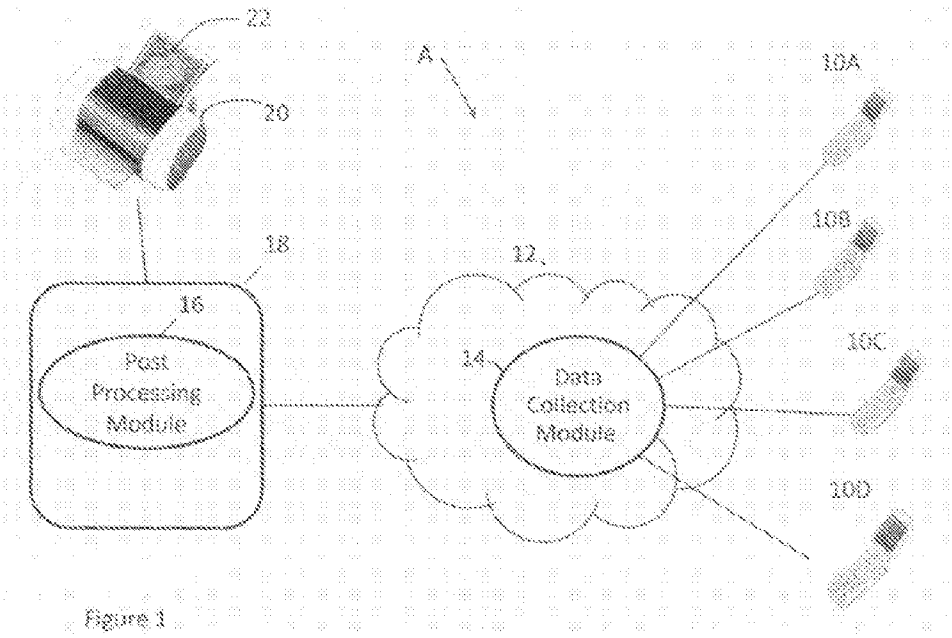


Figure 1 depicts Kuruvilla's system for determining network coverage. Ex. 1007, Fig. 1.

As shown in Figure 1, "communications infrastructure A includes a plurality of mobile units 10A, 10B, 10C, 10D," that "are in communication with a network provider 12." Ex. 1007 ¶¶ 32, 34. Network provider 12 "includes a data collection module 14." *Id.* "The data collection module collects RF signal measurements and location information from multiple mobile phones in response to a trigger." *Id.* ¶ 8. Data collection module 14 is "in communication with a post processing network element 18," which includes "a post processing module" 16. *Id.* ¶¶ 32, 34. The "post processing module plots the RF coverage information on a map using data uploaded from the data collection module." *Id.* ¶ 8. "A wireless provider may use this information in order to correct RF coverage problems." *Id.*

3. Motivation to Combine Olofsson With Kuruvilla

Petitioner provides several reasons why one of ordinary skill would have been motivated to combine Olofsson with Kuruvilla to arrive at the claimed invention. Pet. 22–31. Relying on Dr. Kotzin, Petitioner argues

that Olofsson and Kuruvilla "are in the same field of endeavor" and "are directed to solving the same problem—evaluating coverage of a network in a more efficient manner than conventional drive tests by using measurement information from existing UEs." *Id.* at 23 (citing Ex. 1003 ¶¶ 111, 133, 160, 187, 215, 236, 252, 274; Ex. 1006, 5:14–6:9, 8:25–9:4; Ex. 1007 ¶¶ 5–6). Petitioner also asserts that both systems "are very similar," and "evaluate coverage by instructing and leveraging existing UEs to obtain signal information from neighboring networks." *Id.* (citing Ex. 1003 ¶¶ 112, 131, 161, 188, 216, 237, 253, 275; Ex. 1006, 9:8–14, 10:11–17, Fig. 1; Ex. 1007 ¶¶ 8, 34, 36, 45, 48, 50, 53, 56, Fig. 3). Petitioner further argues that "both are directed to evaluating network coverage using improved techniques over conventional drive tests." *Id.* at 24 (citing Ex. 1003 ¶¶ 113, 135, 162, 189, 217, 238, 254, 276; Ex. 1006, 3:13–4:15, 5:14–6:9, 8:25–9:4; Ex. 1007 ¶¶ 5–6).

As for the implementation details, Petitioner argues that one of ordinary skill "would have been motivated to combine Olofsson's system involving two wireless access networks with Kuruvilla's data collection module and post processing module." Pet. 24 (citing Ex. 1003 ¶¶ 111–119, 133–140, 160–176, 186–204, 214–223, 236–244, 252–259, 274–280). According to Petitioner, Olofsson "teaches selecting and instructing UEs to take measurements, and transmitting the measurement information to the entity responsible for evaluating measurements, the test evaluation server (TES)." *Id.* Petitioner also argues that Olofsson teaches "the UE providing its location information to the TES in the measurement report" and "evaluating the measurement information obtained by the UEs." *Id.* (citing Ex. 1006, 14:6–17, 14:19–21, claim 4). According to Petitioner, one of

ordinary skill considering Olofsson "would have been motivated to look to similar references, such as Kuruvilla for implementation details of the data collection module component instructing and obtaining measurement and location information from the UEs and transmitting it to the entity responsible for evaluating the measurements," as well as "the implementation details of the coverage estimator evaluating the measurement information to generate a coverage assessment, such as a coverage map." *Id.* at 24–25 (citing Ex. 1003 ¶¶ 114, 136, 163, 190, 218, 239; Ex. 1006, 5:14–17, 5:22–6:3, 6:10–13, 7:19–21).

Petitioner further argues that one of ordinary skill would have had a reasonable expectation of success in combining Olofsson and Kuruvilla, and would have been further motivated to make the combination because it would achieve the benefit of improving coverage while avoiding the problems with drive tests. Pet. 26–31.

We find that Petitioner has presented sufficient evidence that one of ordinary skill would have been motivated to combine Olofsson and Kuruvilla as Petitioner proposes. Patent Owner argues that there would have been no motivation to combine Olofsson and Kuruvilla to achieve several of the claim limitations, including the preamble, the "information collector," and the "coverage estimator," which are discussed in the sections of Patent Owner's Response presenting argument on those limitations. *See* PO Resp. 25, 35–37, 39–40. We will discuss Patent Owner's motivation to combine arguments in the sections addressing these limitations below.

4. Analysis of Independent Claim 1

a) 1[preamble]: "[a]n automatic coverage assessment system configured for generating a coverage assessment for a second wireless access network of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals"

Petitioner asserts that, to the extent the preamble of claim 1 is limiting, the Olofsson-Kuruvilla combination discloses it. Pet. 31–34. Petitioner argues that Olofsson "discloses an originating network (first wireless access network) and a target network (second wireless access network) providing telecommunication services." *Id.* at 31 (citing Ex. 1006, code (57), 8:18–20). Petitioner contends that "[t]he first and second networks are capable of providing service to a plurality of terminals." *Id.* at 31–32 (citing Ex. 1006, 7:14–19, 8:1–9, 9:1–4). Petitioner also argues that Olofsson discloses an automatic coverage assessment system configured for generating a coverage assessment of the second wireless network in which UEs provide measurement data to allow for evaluation of coverage and service quality. *Id.* at 32 (citing Ex. 1006, 5:14–17, 5:22–6:3, 6:10–13). Petitioner argues that Kuruvilla also discloses an automatic coverage assessment system configured for generating a coverage assessment. *Id.* at 33.

Patent Owner disagrees, relying on its claim construction that the preambles "require a system, mobile user terminal, or network node for a telecommunications infrastructure comprising first and second wireless access networks, which are both ***operational*** and capable of providing services to a plurality of terminals." PO Resp. 21–22 (emphasis added). Patent Owner argues that, "even though Olofsson discloses the interactions

of two communications systems (defined as 'originating' and 'target' networks) to perform measurements on the 'target network,' the Olofsson system is dedicated to conducting 'radio coverage or service quality measurements of **a system not yet open for public use**' (the 'target network') 'while providing services of another system, such as a legacy system' (the 'originating network')." *Id.* at 22 (citing Ex. 1006, 5:23–25; Ex. 2008 ¶ 55). Patent Owner also asserts that Olofsson distinguishes its invention from the prior art, which "focuses on a single [system] for communications and measurements and **also requires that this system is made available for communications**." *Id.* (citing Ex. 1006, 4:19–21; Ex. 2008 ¶ 56). In other words, according to Patent Owner, even though Olofsson's target network is "providing radio coverage for the respective radio access technology," it "is not yet allowing service to mobile terminals that could be connected to the 'originating network,' because the 'target network' is not open for public use, and is not 'made available for communications.'" *Id.* at 22–23. "[T]herefore," Patent Owner contends, "no subscriber module terminals can be associated with [the target network], unless they are dedicated, 'test' terminals." *Id.* at 23.

Patent Owner also argues that one of ordinary skill would not have been motivated to combine Olofsson and Kuruvilla because "Olofsson explicitly differentiates itself from the prior art by stating that all known prior art references require that the wireless networks which are being assessed are required to be made available for communications," and "Kuruvilla is one such prior art system, where the wireless network provides services and is open for public use." PO Resp. 25 (citing Ex. 1006, 4:19–21; Ex. 1007 ¶ 8; Ex. 2008 ¶ 64). According to Patent Owner, "Olofsson

explicitly explains that *not* requiring both the networks to be available for communications is what distinguishes Olofsson's system from prior art." *Id.* (citing Ex. 1006, 4:19–21; Ex. 1007 ¶ 8; Ex. 2008 ¶ 65).

Petitioner responds that Patent Owner "improperly reads out 'capable of' from the preamble's recited 'capable of providing services,' and instead imports a requirement that the network 'actually provide' commercial—as opposed to test—services to UEs." Pet. Reply 7 (citing PO Resp. 24). Petitioner asserts that Patent Owner's expert admitted that one of ordinary skill "would have understood that networks may be 'capable of providing' service but not 'actually providing' commercial service at a given time; for example, if the network temporarily is congested, or tuning or configuration has not yet been completed." *Id.* (citing Ex. 1034, 38:3–39:2; Ex. 1036 ¶ 19). Petitioner also disagrees with Patent Owner's argument regarding "test" terminals, arguing that "the '089 [p]atent claims broadly recite 'terminals' without excluding 'test' terminals," and that Olofsson "does not describe its UEs as 'test' terminals" in any event." *Id.*

Petitioner also argues that Patent Owner "ignores that Olofsson gives examples of systems 'not available for public usage' that align with the '089 [p]atent's disclosed embodiments of the second network," such as "newly deployed systems using a new radio access technology." Pet. Reply 6 (emphasis omitted) (citing Ex. 1006, 5:22–24, 7:19–25). Petitioner argues that this disclosure is consistent with the '089 patent's disclosure of LTE, which was a newly deployed system at the time of the alleged invention. *Id.* (citing Ex. 1001, 6:51–55, 7:61; Ex. 1034, 12:10–12; Ex. 1036 ¶ 18).

With respect to motivation to combine, Petitioner argues that Patent Owner "mischaracterizes Olofsson's point of novelty as a target network not

available for public use." Pet. Reply 8–9. To the contrary, according to Petitioner, "Olofsson distinguishes prior art based on the broader concept of measuring the target network to evaluate coverage," and nothing in the prior art "limits or discourages application of Kuruvilla's coverage assessment system to emerging or nonpublic networks." *Id.* at 9 (citing Ex. 1006, 4:22–25; Ex. 1034, 59:8–20).

Based on the full trial record, we find that Petitioner has made a sufficient showing that the preamble would have been obvious to one of ordinary skill based on the Olofsson-Kuruvilla combination, and disagree with Patent Owner's arguments to the contrary. First, Patent Owner relies on its construction of the language in the preamble to require that the first and second networks must be "operational" in addition to being "capable of providing services." However, as discussed above, we have rejected that construction. *See* § II.A.2, *supra*. Similarly, we disagree with Patent Owner's assertion that the claim language does not cover the use of "test" terminals or networks that are not "open for public use," because nothing in the claim language excludes the use of "test" terminals or limits the network to one that is open for public use as opposed to a network that may be undergoing testing or otherwise not yet accessible by the general public.

We also agree with Petitioner that Olofsson provides examples of networks that are "capable of providing services" even if they are not yet available to the public. Olofsson describes "example embodiments of the invention to perform radio coverage or ***service quality measurements*** of a system not yet open for public use," indicating that the system is capable of providing services even if those services have not yet been made available to the public. Ex. 1006, 5:22–24 (emphasis added); *see id.* at 7:9–13 (the

system may be used for "provid[ing] data necessary for establishing reliable operations and ***a reliable service quality level*** when the communication system is made available for public use"). Additionally, Olofsson discloses "non-exclusive examples" of such systems that would be capable of providing services:

> Non-exclusive examples of such systems not available for public usage are newly deployed systems using a new radio access technology, systems, possibly of a same radio technology, providing new frequency bands or adding radio carriers not earlier supported to an existing network, and systems where part of the network previously available for public usage is (temporarily) brought into a state of operation preventing public usage, e.g. for the purpose of tuning or reconfiguration.

Ex. 1006, 7:19–25. Indeed, Olofsson's example of "newly deployed systems" is similar to the '089 patent's disclosure of a second wireless access coverage with "no or poor radio coverage" such as an LTE network "at the beginning of the LTE deployment." Ex. 1001, 7:58–65. Olofsson further discloses the use of "dual-mode" UEs "capable of operating on more than one radio access technology" which measure from the target network in active mode using a dedicated channel. Ex. 1006, 8:4–9, 10:14–11:7. We agree with and find credible Dr. Kotzin's testimony that one of ordinary skill would have understood that these disclosures indicate that the target network was "capable of providing services" to the UE. Ex. 1036 ¶ 21.

Finally, we disagree with Patent Owner's argument that one of ordinary skill would not have been motivated to combine Olofsson and Kuruvilla because Kuruvilla uses wireless networks that are available for public use, and Olofsson distinguishes its invention from such networks. PO Resp. 25. For this argument, Patent Owner relies on Olofsson's statement

that "[c]ited prior art technology for estimating radio coverage focuses on a single [system] for communications and measurements and also requires that this system is made available for communications." *Id.*; Ex. 1006, 4:19–21. From this, Patent Owner appears to suggest that whether the system is made available for communications by the public is the key distinction over the prior art. PO Resp. 25. Patent Owner, however, ignores Olofsson's statements explaining the purpose of the invention as providing an improvement over "extremely inefficient" drive-tests for confirming and testing system performance, by using a first network to provide signaling to UEs which will then record measurement data for a second network. Ex. 1006, 4:10–15, 4:22–25, 7:9–13, 8:1–4. Thus, we disagree with Patent Owner that Olofsson's key distinction over the prior art is whether the second network is available for use by the public. Moreover, although Olofsson discloses embodiments that involve a second network not yet available for public use, we do not see anything in Olofsson that would discourage one of ordinary skill from applying its teachings to a network that is open for use by the public, since doing so would also eliminate the "extremely inefficient" drive-tests that Olofsson is directed to avoiding.

We also disagree with Patent Owner's argument that one of ordinary skill would not have combined Olofsson with Kuruvilla's public network. Petitioner relies on Kuruvilla for implementation details of Olofsson's data collection module component as well as Olofsson's coverage estimator, not for the details of the second wireless network itself. Pet. 24–25, 33–34. We find that Olofsson's use of its invention for testing a non-public second wireless network would not discourage one of ordinary skill from looking to Kuruvilla for the implementation details of the data collection module and

coverage estimator, because those details would be relevant regardless of whether the network is open to the public or not.

Consequently, based on the full trial record, we find that the preamble would have been obvious over the Olofsson-Kuruvilla combination.[6]

b) 1[a]: "an information collector;"

1[a][i]: "wherein the information collector is configured to: (i) select one or more terminals from at least part of the plurality of the terminals capable of communicating with both the first wireless network and the second wireless network;"

1[a][ii]: "(ii) instruct the selected one or more terminals to measure signals from the second wireless access network;"

1[a][iii]: "(iii) obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals; and"

1[a][iv]: "(iv) provide the measurement information to the coverage estimator"

Petitioner argues that the combination of Olofsson and Kuruvilla teaches these limitations. Pet. 34–59. With respect to limitation 1[a][i], Petitioner argues that "Olofsson discloses 'select[ing] at least or more terminals from at least part of the plurality of the terminals.'" *Id.* at 34–35 (citing Ex. 1006, Fig. 1). Petitioner also asserts that these terminals are selected from "the at least part of the plurality of terminals capable of communicating with both the first wireless access network and the second wireless access network." *Id.* at 35. According to Petitioner, Olofsson's

[6] As noted above, because we are persuaded that Petitioner has shown that the prior art teaches the subject matter recited in the preamble, we need not decide whether the preamble is limiting for purposes of this Decision. *See* § II.A.2, *supra*.

originating network is the claimed "first wireless access network" and Olofsson's target network is the claimed "second wireless access network," and Olofsson discloses terminals capable of communicating with both networks. *Id.* at 35–37 (citing Ex. 1006, 8:18–20, 9:1–4, 9:9–12, 16:11–17:4).

Petitioner also argues that in the Olofsson-Kuruvilla combination this selection is performed by an "information collector." Pet. 38–40. According to Petitioner, one of ordinary skill "would have understood that one or more components of Olofsson's originating network performs the claimed selecting step." *Id.* at 38 (citing Ex. 1006, 9:9–12, Fig. 1; Ex. 1003 ¶ 129). Petitioner also argues that Kuruvilla discloses an "information collector" in the form of data collection module 14, which "collects RF signal measurements and location information from multiple mobile phones" and "is a component of the network." *Id.* (citing Ex. 1007 ¶¶ 8, 20, 34, 36, Fig. 1). Petitioner contends that one of ordinary skill "would have been motivated to modify one or more components of Olofsson's originating network to include Kuruvilla's data collection module" for the reasons discussed above in the section addressing motivation to combine. *See* § II.E.3, *supra*. Petitioner further contends that the combination teaches the corresponding structure for the functions performed by this limitation, specifically a processor implementing an algorithm to perform the claimed selecting function, or equivalents thereof. Pet. 39–40 (citing Ex. 1006, 9:8–9, 18:6–7, 18:23–17; Ex. 1007 ¶ 8; Ex. 1003 ¶ 132).

With respect to limitation 1[a][ii], Petitioner argues that Olofsson "discloses 'instruct[ing] the selected one or more terminals to measure signals from the second wireless access network.'" Pet. 40 (alteration in

original). Specifically, Petitioner argues that Olofsson "discloses 'inform[ing] . . . selected UEs . . . to measure on a target cell [second wireless access network],' where '[o]ne required selection criteria is [for] UEs to support the radio access technology . . . of the target network.'" *Id.* (citing Ex. 1006, 9:8–14, Fig. 1 (step 12)) (alterations in original). According to Petitioner, these "instructions instruct the UEs to measure received signals of the second wireless access network" in order "to determine service quality and radio coverage." *Id.* at 41–42 (citing Ex. 1006, 10:7–10, 12:12–15, 12:24–13:10). Petitioner further argues that the Olofsson-Kuruvilla combination teaches the corresponding structure for the functions performed by this limitation (or equivalent structure), specifically "one or more components of the originating network (information collector)" that "instruct the terminals via an interface of the first wireless access network." *Id.* at 42–43 (citing Ex. 1006, 2:8–10, 9:21–23, 14:1–3; Ex. 1003 ¶ 146).

With respect to limitation 1[a][iii], Petitioner argues that the Olofsson-Kuruvilla combination discloses "obtain[ing] measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals." Pet. 43–55. Specifically, Petitioner argues that Olofsson discloses that UEs should measure signals of the target cell (second wireless access network) based on signaled instructions from the originating network. *Id.* at 43–44 (citing Ex. 1006, 14:1–3, Fig. 1). Petitioner also asserts that Olofsson discloses that "[t]he selected UEs perform and report such signal measurements of the target network." *Id.* at 44–45 (citing Ex. 1006, 9:8–14, 9:16–18, 10:3–6, 10:11–17, Fig. 1). Petitioner further argues that Kuruvilla's "'data collection module

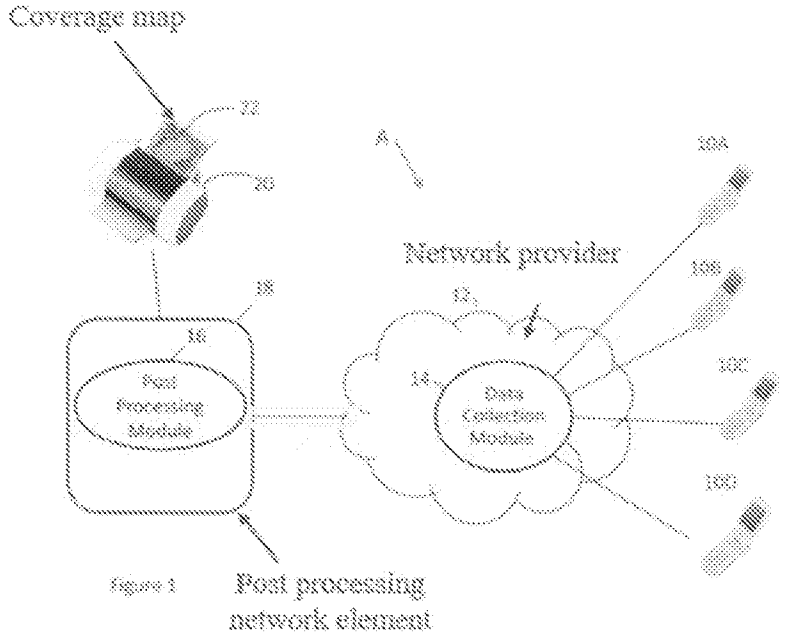
[information collector] collects RF signal measurements." *Id.* at 47–49 (citing Ex. 1007 ¶¶ 8, 34, 36, 48, 53, Fig. 3) (alteration in original).

Petitioner also argues that the Olofsson-Kuruvilla combination teaches the corresponding structure for the functions performed by this limitation, specifically an "information collector" that is "configured to perform the claimed obtaining functionality." Pet. 49. Petitioner argues that, in Olofsson's system, "the UE can send the measurement report to the originating network," and one of ordinary skill would have understood that "one or more components of Olofsson's originating network selects the UEs and instructs the selected UEs to measure information from the target network." *Id.* (citing Ex. 1006, 14:23–26; Ex. 1003 ¶ 157). In light of these disclosures, Petitioner asserts, one of ordinary skill would have found it obvious "for the one or more components of Olofsson's originating network that selected and instructed the UEs to measure information (information collector) to also obtain the requested measurement information from those UEs." *Id.* (citing Ex. 1003 ¶ 157). According to Petitioner, one of ordinary skill would have been motivated to modify Olofsson in this way because it would be efficient for "the component that instructed the UEs to take the measurements to also obtain the measurement reports from the UEs." *Id.* at 50 (citing Ex. 1003 ¶ 158).

Petitioner also argues that one of ordinary skill "would have been motivated to combine Olofsson's system with Kuruvilla's data collection module obtaining the measurement information" such that "the UE transmits the measurement report to the data collection module or information collector of the originating network." Pet. 50–51 (citing Ex. 1006, 14:18–15:3; Ex. 1003 ¶¶ 167, 194). Additionally, Petitioner contends, it would

have been obvious to combine Olofsson and Kuruvilla so that "Kuruvilla's data collection module resid[es] in Olofsson's target network," and have the "UE transmit[] the measurement report to the data collection module or information collector residing in the target network." *Id.* at 51 (citing Ex. 1006, 14:18–15:3, 12:6; Ex. 1003 ¶¶ 168, 196).

With respect to limitation 1[a][iv], Petitioner argues that the Olofsson-Kuruvilla combination "discloses 'provid[ing] the measurement information to the coverage estimator.'" Pet. 56–59. Petitioner states that Olofsson "discloses providing the measurement information to the 'entity being responsible for evaluating the measurements'" (Olofsson's test evaluation server (TES)), but "does not expressly disclose an information collector configured to provide the measurement information to the coverage estimator." *Id.* at 56 (citing Ex. 1006, 14:19–21; Ex. 1003 ¶ 181) (alteration in original). Petitioner argues that Kuruvilla discloses "providing the measurement information to the coverage estimator" as shown by post processing module 16. *Id.* at 56–57 (citing Ex. 1007 ¶¶ 31, 36, 56, Fig. 5 (step 505)). As for the corresponding structure for this element, Petitioner contends that Kuruvilla discloses a communication link between the data collection module and post processing module, highlighted in yellow in Petitioner's annotated version of Kuruvilla's Figure 1, reproduced below:



Petitioner's annotated version of Kuruvilla's Figure 1 with the communication link between data collection module 14 and post processing module 16 highlighted in yellow. Pet. 58 (citing Ex. 1007, Fig. 1, ¶ 34).

Petitioner also argues that Olofsson "expressly discloses interfaces to the communications network infrastructure," and one of ordinary skill "would have understood that the communication link between the information collector and coverage estimator similarly would comprise an interface for providing and obtaining information." *Id.* at 59 (citing Ex. 1006, 2:8–10; Ex. 1003 ¶ 185).

Patent Owner argues that the Olofsson-Kuruvilla combination does not teach the claimed "information collector." PO Resp. 26–37; PO Sur-reply 14–20. First, Patent Owner argues that "Olofsson generally discusses the 'originating network' as being responsible for implementing some of the required operations" (such as informing selected UEs to measure a target cell), "rather than disclosing a ***distinct element*** similar to the '089 'information collector,' which performs the steps of selecting terminals and instructing the selected terminals to measure signals." PO

Resp. 26 (emphasis added) (citing Ex. 1006, 9:9–14; Ex. 2008 ¶ 68). According to Patent Owner, it is not clear from Olofsson "which network elements would perform the specific operations of its selection process or its signaling to the terminals," and Olofsson "remains silent on any details regarding which network element would trigger and perform this selection." *Id.* at 27 (citing Ex. 1006, 10:3–10, 12:12–18, 12:24–13:10, 20:22; Ex. 2008 ¶¶ 70–71). Additionally, Patent Owner contends that Olofsson's disclosure that "as an alternative, the signaling [to the UEs] is transmitted from the target network" would have indicated to one of ordinary skill that the "instructing" step "would be performed by a *different* network element" which "could belong to the 'target network.'" *Id.* (citing Ex. 1006, 12:4–6; Ex. 2008 ¶ 72). "Consequently," Patent Owner argues, "Olofsson fails to disclose or suggest a ***distinct network element*** that performs at least the steps of (1) selecting terminals and (2) instructing them to perform measurements." *Id.* at 27–28 (citing Ex. 2008 ¶ 73) (emphasis added); *see* PO Sur-reply 14–18.

Patent Owner further argues that Olofsson does not disclose or suggest "any ***specific network element*** such as an 'information collector' that would receive ('obtain') the measurement information and further 'provide' those to Olofsson's TES in the target network." PO Resp. 31 (emphasis added). "Instead," Patent Owner asserts, "Olofsson simply teaches that the measurement reports can be transmitted to some generic network elements, *e.g.*, 'transmitted to a base station,' 'the originating cell,' or to [the] 'receiving base station or base station controller' in the target network." *Id.* at 32 (citing Ex. 1006, 14:18–30).

Patent Owner also argues that claim 1 requires the "information collector" to obtain measurement information from the selected terminals and provide this information to the coverage estimator, but Olofsson "teaches a completely different implementation, where the ***terminals*** themselves should report the measurement information directly to a network entity that is responsible for evaluating the measurements — Olofsson's test evaluation server, TES, which is in the target network." PO Resp. 28–29. Therefore, according to Patent Owner, one of ordinary skill "would find no need to add another network device," such as the "information collector," for "obtaining the results of the measurements from the terminals and sending those to Olofsson's test evaluation server, because it would be unnecessary and redundant." *Id.* (citing Ex. 2008 ¶ 75); *see* PO Sur-reply 17–18.

Additionally, Patent Owner acknowledges that "Olofsson discloses the possibility that the terminals (UEs) may transmit the measurement reports to the originating cell instead of to a base station of the target network," but argues that Olofsson "strongly advises against this" because it "would result in additional network signaling and communications relations between the originating and the target network, as well as increased power consumption of the UEs, resulting in draining their batteries faster." PO Resp. 30 (citing Ex. 1006, 14:18–15:3); *see* PO Sur-reply 18. Thus, according to Patent Owner, one of ordinary skill "would not have considered implementing a system that sends the measurement reports from the terminals (UEs) back to the originating network, instead of sending those directly to the TES in the target network." PO Resp. 31.

With respect to Petitioner's reliance on Kuruvilla's data collection module to obtain information from the terminals, Patent Owner argues that

"[n]othing in Kuruvilla suggests that the 'data collection module' is responsible for, and can be used to perform, a *selection* of terminals to perform measurements, or to instruct the terminals about the specific measurements that have to be performed." PO Resp. 33–34 (citing Ex. 2008 ¶ 84). According to Patent Owner, Kuruvilla provides "no disclosure of a process related to 'selection of terminals' to perform measurements," and "Kuruvilla's process is entirely passive, awaiting events such as a dropped call occurring." *Id.* at 34 (citing Ex. 1007 ¶¶ 42, 47; Ex. 2008 ¶ 85). Patent Owner further contends that Kuruvilla fails to disclose or suggest "a specific network component that implements the four functions of the 'information collector' element required by [c]laim 1 of the '089 patent." *Id.* at 34–35 (citing Ex. 1007 ¶¶ 34, 48); *see* PO Sur-reply 16, 19.

Finally, Patent Owner argues that there would have been no motivation to combine Olofsson and Kuruvilla to achieve the required "information collector." PO Resp. 35–37; PO Sur-reply 20–21. Patent Owner asserts that "the functionality of Kuruvilla's 'data collection module' 14 is redundant and unnecessary" in view of Olofsson's disclosure that "the terminals (UEs) transmit the measurement reports direction to the TES," which "should already implement some kind of data storage where all measurement reports are collected and further used for evaluation." PO Resp. 36. Even in "Olofsson's non-preferred scenario" where "the UEs send the measurement reports back to the originating network," according to Patent Owner, the final destination of these reports "remains the TES in the target network," and therefore "[i]t is unlikely that a person of ordinary skill in the art would consider storing these reports in the originating network, let alone storing them in the data storage of the same element that selected the

terminals to perform the measurements, or instructed them for the types of measurements that need to be performed." *Id.* at 36–37 (citing Ex. 2008 ¶ 89); *see* PO Sur-reply 19–20.

Petitioner responds that "[i]n arguing Olofsson must disclose 'a distinct element' [Patent Owner] demands more from Olofsson than is recited in the claims, disclosed in the '089's specification, or even proposed in [Patent Owner's] own construction." Pet. Reply 10. According to Petitioner, Patent Owner's argument "contradicts the '089 patent's disclosed decentralized implementations," which implement functionality "on more than one component," as well as its disclosure "that the 'information collector' may be implemented in a combination of software (executed on a processor) and hardware." *Id.* at 11 (emphasis omitted) (citing Ex. 1001, 7:3–7, 7:29–35; Ex. 1034, 17:1–5). Petitioner also asserts that Patent Owner's arguments criticize the references in isolation and ignore the combination that Petitioner proposes, in which "Kuruvilla's data collection module obtains measurement information from the terminals" and "provides it to the post processing module or coverage estimator." *Id.* at 13, 14 (citing Ex. 1007 ¶¶ 8, 40, 56, Fig 5). Similarly, according to Petitioner, Patent Owner's argument that Kuruvilla does not perform selection improperly considers the references in isolation because Petitioner relies on Olofsson for selection. *Id.* at 15 (citing PO Resp. 32–35; Pet. 34–37).

With regard to motivation to combine, Petitioner responds to Patent Owner's argument that Olofsson "strongly advises" against transmitting the measurement reports to the originating cell by noting that Olofsson expressly discloses that "[o]f course, transmission 14 of measurement reports is possible also in the originating cell." Pet. Reply 17 (emphasis

omitted, alteration in original); PO Resp. 30–31. Petitioner also asserts that one of ordinary skill "would have recognized that the signaling and UE battery expense would not apply to the Olofsson-Kuruvilla combination," because "the selected UEs are already in communication with both the originating and target networks and send the measurement report to a network via uplink signaling in either case, and in the combination the UE transmits to the information collector of either the originating or target network (depending on the embodiment), not both." Pet. Reply 17–18 (citing Pet. 49–54; Ex. 1003 ¶¶ 157, 169–172, 197–200). Petitioner also argues that one of ordinary skill "would have understood the benefits of the entity responsible for evaluating measurements ultimately obtaining the measurements, as disclosed in Olofsson," and "would have been motivated to look to similar references, such as Kuruvilla." *Id.* at 18 (citing Ex. 1006, 14:19–20; Ex. 1003 ¶¶ 163, 190, 203–204). Finally, Petitioner contends that its combination "does not rely on the TES as the 'information collector,'" and that "[t]he claims do not recite that the information collector must store measurements in the first network," as Patent Owner argues. *Id.* (citing PO Resp. 36); *see* PO Sur-reply 20–21.

Based on the full trial record, we find that Petitioner has sufficiently proven that one of ordinary skill would have found the "information collector" elements (including the claimed functions and corresponding structure for those elements) to be obvious over the combination of Olofsson and Kuruvilla. With respect to limitations 1[a][i] and 1[a][ii], Petitioner has sufficiently shown that it would have been obvious to one of ordinary skill that components exist in Olofsson's originating network that select terminals capable of communicating with the originating and target networks and

instruct those terminals to measure signals from the second wireless access network. Pet. 38 (citing Ex. 1006, 9:9–12, Fig. 1; Ex. 1003 ¶ 129); *id.* at 42–43 (citing Ex. 1006, 2:8–10, 9:21–23, 14:1–3; Ex. 1003 ¶ 146). For example, Olofsson discloses that "[o]riginating network informs (12), from an originating cell of the originating network, selected (11) UEs in the originating cell and also being within radio coverage of one or more neighboring cells of the target network, to measure on a target cell," and that one required criteria for selection is that the selected UEs "support the radio access technology or mode of operation for measurements of the target network/target cell." Ex. 1006, 9:9–14; *see id.* at 14:1–3 (explaining that UEs measure signals and parameters of the target cell "according to signaling instructions from [the] originating network."). We also credit Dr. Kotzin's testimony that one of ordinary skill would have understood that "one or more components of Olofsson's originating network selects the UEs and instructs the selected UEs to measure information from the target network." Ex. 1003 ¶ 157. We find that the components within the originating network that perform the selection and instruction of the terminals are distinct from the terminals themselves and can be considered part of an "information collector" under our construction of that term. *See* § II.D.A.3, *supra*.

With respect to limitation 1[a][iii], Petitioner has presented sufficient evidence that one of ordinary skill would have found it obvious for the terminals to report the measurement information back to the components within the originating network that selected and instructed the terminals. Olofsson discloses that the UE measures "signal and parameters of the target cell" and "report[s] the result of the measurements to a network entity being

responsible for evaluating the measurements," which can be "in the originating cell." Ex. 1006, 14:1–3, 14:18–26; *see* Ex. 1003 ¶¶ 153, 156. We also rely on and find credible Dr. Kotzin's testimony that it would have been obvious to a person of ordinary skill for the UEs to transmit the signal measurements "to the one or more components of Olofsson's originating network that instructed the UEs to take the measurements in the first place—the information collector" in order to "obtain the benefits and efficiencies of the component that instructed the UEs to take the measurements to also obtain the measurement reports from the UEs." Ex. 1003 ¶¶ 157–158.

Kuruvilla also discloses a "data collection module" that "collects RF signal measurements" from "multiple mobile phones." Ex. 1007 ¶¶ 8, 34, 36, 48, Figs. 1, 3. We agree with Petitioner's arguments, as set forth in Section II.D.3 above, that one of ordinary skill would have found it obvious to modify Olofsson's originating network to include Kuruvilla's data collection module because it provides implementation details for a component that instructs and obtains measurement and location information from the UEs. *See* § II.D.3, *supra*; Pet. 22–31, 38–40, 47–52, 54–55; Ex. 1003 ¶¶ 114, 133–140, 163, 167, 190, 218, 239. We further agree with Petitioner that it would have been obvious to combine Olofsson and Kuruvilla so that Kuruvilla's data collection module resides in Olofsson's target network (along with the other components of the "information collector" that select and instruct the terminals), and receives measurements from the UE. Pet. 51. In this regard, Olofsson teaches that, as an alternative, signaling the UEs may be "transmitted from the target network," and we credit Dr. Kotzin's testimony that "the Olofsson-Kuruvilla combination also teaches the UE transmitting the measurement report to the

data collection module or information collector residing in the target network." Ex. 1006, 12:6; Ex. 1003 ¶¶ 168, 196.

With respect to limitation 1[a][iv], we agree with Petitioner that Olofsson discloses providing the measurement information to the "entity being responsible for evaluating the measurements, but does not expressly disclose an information collector configured to provide the measurement information to a coverage estimator." Pet. 56; Ex. 1003 ¶ 181. However, we find that Kuruvilla discloses providing the measurement information to a coverage estimator when it discloses that "data collection module 14 is used to collect data," and "[t]he data received is forwarded to a post processing network element 18 which includes a post processing module 16," which "is configured to record and store the data and organize into a report." Ex. 1007 ¶¶ 36, 40; Pet. 56–59. Additionally, Petitioner has sufficiently shown that one of ordinary skill would have been motivated to combine Kuruvilla's post processing module with Olofsson because having Kuruvilla's post processing module obtain the measurement information and provide it to the coverage estimator would centralize this functionality at the network rather than the UE, thereby saving UE signaling and battery power. *See* Pet. 30–31; Ex. 1003 ¶¶ 118, 140, 176, 204, 223, 244, 259, 280.

We do not agree with Patent Owner's arguments as to this claim element. First, we disagree with Patent Owner's argument that Olofsson does not disclose "a ***distinct element*** similar to the '089 'information collector,' which performs the steps of selecting terminals and instructing the selected terminals to measure signals." PO Resp. 26 (emphasis added). As explained above, we have construed the "information collector" to require that it be "distinct" from the terminals, but do not adopt Patent

Owner's construction that there must be a "distinct entity" (or "distinct element") that performs all four of the functions of the "information collector." *See supra* § II.A.3. The portions of the Olofsson-Kuruvilla combination that Petitioner relies on for the "information collector," discussed above, are distinct from the terminals (UEs) themselves, which is the only "distinctness" the claim requires. Patent Owner fails to present persuasive evidence to the contrary. For similar reasons, we do not agree with Patent Owner's argument that "Olofsson . . . does not disclose or suggest any ***specific network element*** such as an 'information collector' that would receive ('obtain') the measurement information and further 'provide' those to Olofsson's TES in the target network." *See* PO Resp. 31–32 (emphasis added).

Second we disagree with Patent Owner's argument that, because Olofsson teaches that "the ***terminals*** themselves should report the measurement directly to a network entity that is responsible for evaluating the measurements" (the test evaluation server (TES)), adding another network device (such as the "information collector" or Kuruvilla's "data collection module") for "obtaining the results of the measurements from the terminals and sending those to Olofsson's test evaluation server" would be "unnecessary and redundant." PO Resp. 28–29, 35–37. Although Olofsson's preferred embodiment involves the UEs reporting measurements to the TES in the target network, Petitioner relies on Olofsson's alternative embodiment in which the UE transmits measurements to "the originating cell." Pet. 47, 49; Ex. 1006, 14:23–26; Ex. 1003 ¶¶ 153, 157. Olofsson also discloses having the UE send the measurements to an intermediate element, such as a receiving base station, instead of sending them directly to the TES.

Ex. 1006, 14:18–15:3 ("When measurement reports are transmitted to the target network, the receiving base station or base station controller will forward received information to the relevant TES."); Ex. 1003 ¶ 173.

Additionally, we rely on and find credible Dr. Kotzin's testimony that it would have been obvious to a person of ordinary skill "for the one or more components of Olofsson's originating network that selected and instructed the UEs to measure information (information collector) to also obtain the requested measurement information from those UEs" in order to "obtain the benefits and efficiencies" of having the same component both instruct the UEs and obtain measurements from them, and that this configuration would not involve additional signaling or battery expense by the UE because "the selected UEs are in communication with both the originating and target networks." Ex. 1003 ¶¶ 157–158, 172. In light of this evidence, we find that the Olofsson-Kuruvilla combination teaches multiple ways of having the UEs report measurement data back to the system, and that one of ordinary skill in the art would not consider it to be "unnecessary and redundant" for the "information collector" to both instruct the UEs and receive measurements from them.

Third, we disagree with Patent Owner's argument that Kuruvilla does not teach that its data collection module performs the four functions recited for the "information collector," including selecting and instructing terminals to perform measurements. PO Resp. 33–35. Petitioner does not rely on Kuruvilla for the "select[ing]" and "instruct[ing]" functions, or for the use of terminals connected to first and second networks, but instead relies on Olofsson for those limitations. Thus, Patent Owner's argument considers Kuruvilla individually rather than addressing the Olofsson-Kuruvilla

combination relied on by Petitioner. One cannot defeat a showing of obviousness by merely attacking the references individually where, as here, the arguments are based on combinations of references. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

Fourth, we do not agree with Patent Owner's argument that one of ordinary skill "would not have considered implementing a system that sends the measurement reports from the terminals (UEs) back to the originating network" because Olofsson "strongly advises against this" due to the "additional network signaling and communications relations between the originating and the target network, as well as increased power consumption of the UEs, resulting in draining their batteries faster." PO Resp. 30–31 (citing Ex. 1006, 14:18–15:3). As noted above, Olofsson states that measurement reports are "preferably" transmitted to the base station of the target cell, but also explains that, "[o]f course transmission (14) of measurement reports is possible also in the originating cell." Ex. 1006, 14:18–26. Although Olofsson suggests that transmitting measurements to the originating network is not preferred because it involves "additional network signaling and communications relations, among other things draining batteries of battery powered UEs," we find that Olofsson here merely identifies this embodiment as non-preferred, and does not clearly discourage or teach away from transmitting measurements to the originating network. As the Federal Circuit has explained, "[a] statement that a particular combination is not a preferred embodiment does not teach away absent clear discouragement of that combination." *Syntex (U.S.A.) LLC v. Apotex, Inc.*, 407 F.3d 1371, 1380 (Fed. Cir. 2005). Moreover, we find credible Dr. Kotzin's testimony that one of ordinary skill would have seen a

benefit to having the same components that selected and instructed the UEs also obtain measurements from the UEs, and that "there would not be additional signaling or UE battery expense for the UE to send the measurement report to the information collector in the originating network, particularly since the selected UEs are in communication with both the originating and target networks." Ex. 1003 ¶ 157.

Finally, we disagree with Patent Owner's argument that one of ordinary skill would not have been motivated to combine Olofsson and Kuruvilla because, even where the UEs send measurements back to the originating network, the final destination of these reports "remains the TES in the target network," and therefore "[i]t is unlikely that a person of ordinary skill in the art would consider storing these reports in the originating network, let alone storing them in the data storage of the same element that selected the terminals to perform the measurements, or instructed them for the types of measurements that need to be performed." PO Resp. 36–37. As Petitioner correctly points out, its combination does not rely on Olofsson's TES as the "information collector," and the claims do not require that the information collector store measurements in the first network, as Patent Owner contends. Pet. Reply 18; Ex. 1001, 11:53–67.

For the foregoing reasons, and based on the full trial record, Petitioner has sufficiently proven that limitations 1[a][i]–1[a][iv] would have been obvious over the combination of Olofsson and Kuruvilla.

c) *1[b]: "a coverage estimator;"*

1[b][i]: "wherein the coverage estimator is configured to: (i) obtain measurement information from the information collector, and"

1[b][ii]: "(ii) based on the obtained measurement information, generate the coverage assessment for the second wireless access network of the telecommunications infrastructure;"

Petitioner argues that the combination of Olofsson and Kuruvilla teaches these limitations. Pet. 59–67. Petitioner asserts that Olofsson "discloses a coverage estimator as the 'test evaluation server, TES,' which is 'a network entity being responsible for evaluating measurements.'" *Id.* at 61 (citing Ex. 1006, 14:19–21, 24:8–9). According to Petitioner, the TES "generates a coverage assessment" of the second wireless access network "by processing and evaluating UEs' measurement reports (obtained measurement information) to determine service quality and radio coverage." *Id.* at 63–64 (citing Ex. 1006, 4:22–5:18).

"Additionally," Petitioner contends, "Kuruvilla discloses a coverage estimator as a post processing module," that "is configured to receive the collected data and generate a report, such as coverage map 22." Pet. 61–62 (citing Ex. 1007 ¶ 40, Fig. 1), 64–65. The report may be used "to 'show[] coverage area network problems,' and 'determine geographic areas where signal strengths are poor.'" *Id.* at 65 (citing Ex. 1007 ¶ 50). Petitioner further argues that the Olofsson-Kuruvilla combination teaches "an interface to the communication link that carries measurement information from the information collector, or equivalents thereof." *Id.* at 62.

In terms of corresponding structure, Petitioner argues that Olofsson discloses that the TES "comprises 'processing circuitry' for processing the

measurement reports," and Kuruvilla "discloses that the post processing module is a 'software module.'" Pet. 66 (citing Ex. 1006, 18:11–13; Ex. 1007 ¶¶ 8, 33).

Patent Owner argues that the Olofsson-Kuruvilla combination fails to teach the "coverage estimator." PO Resp. 37–40; PO Sur-reply 21–23. Patent Owner asserts that "Olofsson teaches that the TES obtains the measurement reports from the ***terminals*** (UEs) themselves, rather than obtaining them from an ***information collector*** as required by this limitation of [c]laim 1," and is "silent about the presence of a network component that would be responsible for collecting measurement reports from the selected UEs, and then sending those to the TES upon request." PO Resp. 38. Patent Owner also contends that Kuruvilla's data collection module is not equivalent to the "information collector" of claim 1. *Id.* at 39. Patent Owner further argues that one of ordinary skill would not have been motivated to combine Olofsson and Kuruvilla to achieve a coverage estimator configured to "obtain the measurement information from the information collector" because "Olofsson teaches that the UEs report the measurement information directly to the TES" which would make Kuruvilla's data collection module "unnecessary and obsolete." *Id.* at 39–40 (citing Ex. 1006, 14:18–21; Ex. 2008 ¶ 99).

Petitioner responds that "Olofsson discloses that the measurement information ultimately should be reported to the entity responsible for evaluating measurements, and Kuruvilla provides the implementation details for (1) the data collection module providing the information to the post processing module, and (2) the post processing module estimating coverage." Pet. Reply 19–20. Petitioner also asserts that Kuruvilla's data

collection module would not be "obsolete and unnecessary" in the combination because one of ordinary skill would have understood the benefits of having the same entity that instructed the UEs to take measurements also obtain the measurements and pass them to the entity responsible for evaluating them. *Id.* at 20–21 (citing Ex. 1003 ¶ 157).

Based on the full trial record, we find that Petitioner has made a sufficient showing that the Olofsson-Kuruvilla combination teaches the claimed "coverage estimator," including the claimed functions and corresponding structure for this claim element. We do not agree with Patent Owner's arguments, which largely retread ground covered in its arguments directed to the "information collector" claim limitations. Specifically, we disagree with Patent Owner's argument that Olofsson's TES obtains the measurement reports from the terminals instead of from an information collector because, as discussed in the previous section, Petitioner sufficiently shows that it would have been obvious in the Olofsson-Kuruvilla combination for the terminals to send their measurements back to a component in the originating network which would then forward them on to a "coverage estimator" (such as the TES or Kuruvilla's post processing module). *See* § II.D.4(b), *supra*. Additionally, as also discussed in the previous section, Patent Owner's argument that Kuruvilla's data collection module does not perform all of the claimed functions of the "information collector" (such as the selecting and instructing steps) is flawed because Petitioner relies on Olofsson for those steps. *See id.* Finally, we find that Olofsson's embodiment in which the UEs report measurements directly to the TES would not render Kuruvilla's data collection module "unnecessary and obsolete" because, as discussed above, one of ordinary skill would have

understood that there would be benefits to having the same network entity instruct the UEs to take measurements, receive those measurements, and send them along to the entity responsible for evaluating them. *See id.*; Pet. Reply 20–21; Ex. 1003 ¶ 157.

For the foregoing reasons, and based on the complete trial record, Petitioner has sufficiently proven that limitations 1[b][i]–1[b][ii] would have been obvious over the combination of Olofsson and Kuruvilla.

d) Summary for Claim 1

For the foregoing reasons, and based on the full trial record, Petitioner has proven by a preponderance of the evidence that claim 1 is unpatentable over Olofsson and Kuruvilla.

5. Dependent Claim 2

Claim 2 depends from claim 1, and further recites that the system "comprises a trigger configured for triggering the information collector to select the one or more terminals." Ex. 1001, 12:7–10. Petitioner argues that Olofsson "discloses triggering UEs to perform measurements of the target network," but "does not expressly disclose a trigger configured for triggering the information collector to *select* the one or more terminals." Pet. 67 (citing Ex. 1006, code (57), 20:6–8; Ex. 1003 ¶ 246). Petitioner argues that Kuruvilla discloses the use of a trigger for initiating the disclosed method and triggering the data collection module to collect the measured data from the UEs. *Id.* (citing Ex. 1007 ¶¶ 8–9, 41). Relying on Dr. Kotzin, Petitioner argues that it would have been obvious to one of ordinary skill to modify Kuruvilla's trigger to be configured for triggering the information collector to select the one or more terminals. *Id.* at 69 (citing Ex. 1003 ¶¶ 250–251).

Patent Owner argues that "Olofsson discloses triggering UEs to perform ***measurements*** of the target network, but it is silent about anything that would trigger the process of ***selection*** of one or more terminals for measurements." PO Resp. 40. Patent Owner acknowledges that "Kuruvilla does discuss triggers," but asserts that "these triggers are not related to ***selection*** of terminals to perform measurements." *Id.* at 41. "Instead," according to Patent Owner, "in Kuruvilla, the start of measurements is 'triggered' by an event that occurs such as a dropped call, lost connection, or mobile terminal power increase," and "[t]he trigger is an event which prompts a request for RF signal measurement." *Id.* (citing Ex. 1007 ¶¶ 42, 47). "Consequently," Patent Owner contends, Kuruvilla does not disclose or suggest "the step of 'select[ing] one or more terminals from at least part of the plurality of terminals" to perform measurements, but instead "passively reacts to events that occur and triggers measurements in response to those events." *Id.* (citing Ex. 2008 ¶¶ 104, 107) (alteration in original). Thus, Patent Owner argues, one of ordinary skill "would not consider that Kuruvilla's triggers should also start the process of ***selection*** of terminals to perform measurements." *Id.* at 42 (citing Ex. 2008 ¶ 109). *See* PO Sur-reply 23–24.

In response, Petitioner argues that Patent Owner is considering the references in isolation, and in the combination it would have been obvious to one of ordinary skill "for the trigger to apply to selection" of terminals as well as for obtaining measurements by the terminals. Pet. Reply 21. Petitioner also asserts that Mr. Pachamanov testified that, in the '089 patent, "[t]he trigger is something that starts the process of selection," which "aligns with Kuruvilla's disclosure that the method 'begins with the trigger (at step

203).'" *Id.* (citing Ex. 1007 ¶ 41) (alteration in original). Petitioner further contends that Patent Owner's attempt to distinguish Kuruvilla's triggers as "passive" is unavailing because Mr. Pachamanov admitted that Kuruvilla discloses "event-based triggers," and "the '089 [p]atent discloses periodical (passive) triggers too." *Id.* at 21–22 (citing Ex. 1034, 79:10–80:4; Ex. 1001, 3:64–66; Ex. 1007 ¶¶ 10–14).

Based on the full trial record, we find that Petitioner has sufficiently shown that the Olofsson-Kuruvilla combination teaches this limitation. Olofsson discloses selecting a subset of available UEs from the originating network and "providing signaling from the first communication network for triggering the user equipment to perform test or measurement of the second communication network." Ex. 1006, Fig. 1, 9:9–12, 10:20–22, 20:6–8, code (57); Ex. 1003 ¶ 246. Kuruvilla discloses that its method "begins with the trigger." Ex. 1007 ¶ 41, Figs. 2, 3; Ex. 1003 ¶¶ 247, 251. We agree with and find credible Dr. Kotzin's testimony that "[i]t would have been obvious to a person of ordinary skill in the art that if the information collector instructs only selected UEs to measure signals and must first perform the selection, that the trigger would apply to the information collector for selecting the UEs," and that this modification could have been made "without substantial modification or undue experimentation." Ex. 1003 ¶¶ 251, 256. We further credit Dr. Kotzin's testimony that one of ordinary skill would have recognized that using a trigger for the selecting as well as the instructing of the UEs would "regulate when the information collector selects and instructs the UEs to take measurements, thereby achieving further benefits of conserving UE battery power and reducing network load." *Id.* ¶ 258. Based on this evidence, we find that using the trigger to initiate

the selecting and instructing of the UEs would have been a minor variation of Olofsson's system that would have been obvious to and well within the skill of a person of ordinary skill in the art.

We also disagree with Patent Owner's argument that neither Olofsson or Kuruvilla individually discloses using a trigger for selection of terminals, because this argument considers the references in isolation. PO Resp. 40–41. Additionally, Patent Owner's argument that Kuruvilla "passively reacts to events" and "triggers measurements in response to those events" is not persuasive because claim 1 does not include any limitation that would exclude "passive" triggers, and Kuruvilla discloses "event based triggers." Ex. 1007 ¶¶ 10–14.

For these reasons, Petitioner has proven by a preponderance of the evidence that claim 2 would have been obvious based on the Olofsson-Kuruvilla combination.

6. Dependent Claims 3 and 4

Claim 3 depends from claim 1, and recites that "the information collector is further configured to obtain location information for at least one of the at least part of the plurality of terminals prior to selecting the one or more terminals." Ex. 1001, 12:11–15. Claim 4 depends from claim 3, and recites that "the information collector is further configured to associate the location information with at least one of the selected one or more terminals and provide the location information associated with the at least one of the selected one or more terminals to the coverage estimator." *Id.* at 12:16–21.

Petitioner argues that Olofsson's UEs "comprise a GPS or other positioning system to determine location information," and Olofsson "expressly discloses that '***[t]he selection process (11) preferably***

includes . . . UE location, i.e., the geographical position for which measurement data is desired.'" Pet. 69–70 (quoting Ex. 1006, 10:3–6 (alterations in original); citing Ex. 1006, 17:29–18:4). Therefore, Petitioner argues, the information collector obtains the UE location "prior to selecting the one or more terminals, since UE location is taken into account as part of the selection process." *Id.* at 70 (citing Ex. 1003 ¶ 262). Petitioner also argues that the combination teaches the corresponding structure for this process because, "[f]or the information collector to include UE location in the selection process and then instruct the UE to obtain measurement information," the information collector "would be configured to associate the location information with at least one of the selected one or more terminals." *Id.* at 71 (citing Ex. 1003 ¶ 268). Additionally, with respect to claim 4, Petitioner argues that Olofsson teaches providing the UE location with the signal measurements in the measurement report, which is ultimately provided to the TES, as well as corresponding structure in terms of an information collector configured to perform this functionality. *Id.* at 74–77 (citing Ex. 1006, 14:6–17, 17:27–29).

Petitioner further argues that Kuruvilla discloses the claimed associating functionality of claim 3, because its data collection module (information collector) receives location information from the UEs, which includes a mobile identification number, and maps the precise mobile location data at a given time. Pet. 72 (citing Ex. 1007 ¶¶ 8–9, 15–16, 18, 21). Additionally, according to Petitioner, Kuruvilla discloses providing data, including the location information associated with selected terminals, to the post processing module (coverage estimator) via the data collection

module (information collector), and therefore satisfies claim 4. *Id.* at 74 (citing Ex. 1007 ¶ 56).

With respect to claim 3, Patent Owner argues that Olofsson does not disclose or suggest "**obtaining** location information for at least one of the terminals **prior to** selecting the one or more terminals," but instead merely states that "'preferably' the UE location has to be taken into account during the selection process," which is "the only disclosure on the topic." PO Resp. 43. Patent Owner also asserts that "Kuruvilla does not disclose or suggest a selection process at all, and is silent about any consideration of location information prior to triggering a terminal to perform measurements." *Id.*

With respect to claim 4, Patent Owner argues that "the location information disclosed by Olofsson/Kuruvilla that is associated with the terminals and sent to the TES/data collection module is ***not*** initial location information obtained by the information collector ***prior to selecting*** the terminal to perform measurements," as the claim requires. PO Resp. 45. "Instead," according to Patent Owner, "both Olofsson and Kuruvilla disclose associating and sending the actual location information that is obtained ***when the measurement information*** is being collected." *Id.* To support this argument, Patent Owner points to the '089 patent specification's disclosure that the location of the terminals may change between the time of the terminal is selected and the time the terminal actually performs the measurement. *Id.* at 46 (citing Ex. 1001, 9:20–29). Thus, Patent Owner contends, if the location at the time of measurement is sent (as Olofsson and Kuruvilla purportedly do), "the terminal may have moved outside the area of interest." *Id.* (citing Ex. 2008 ¶ 124).

With respect to claim 3, Petitioner responds that, because "Olofsson discloses that the 'selection process (11) preferably includes . . . UE location," one of ordinary skill "would have understood that the information collector obtains location information prior to selecting if UE location is taken into account in the selection process." Pet. Reply 22 (citing Ex. 1006, 10:3–6; Ex. 1003 ¶ 262) (alteration in original). With respect to claim 4, Petitioner argues that Kuruvilla discloses providing location to the post processing module. *Id.* at 25 (citing Pet. 74–76; Ex. 1007 ¶ 56, Fig. 5). Therefore, according to Petitioner, one of ordinary skill "would have understood that in the Olofsson-Kuruvilla combination, the information collector would be configured to provide pre-selection location to the post processing module." *Id.* (citing Ex. 1036 ¶ 61). Additionally, Petitioner contends, pre-selection location information may include "cell-level location information," which Olofsson discloses being provided by the UE when it registers with the network. *Id.* at 26 (citing Ex. 1006, 8:16–17). Finally, Petitioner argues that there is no requirement that a "UE's pre-selection location information must differ from the measurement report's location information"; for example, if the UE remains in the same cell between selection and measurement. *Id.* at 27 (citing Ex. 1036 ¶¶ 68–70; Ex. 1034, 33:24–34:2).

We determine that Petitioner has sufficiently shown that claims 3 and 4, including the claimed functions and corresponding structure, would have been obvious over Olofsson in view of Kuruvilla. With respect to claim 3, Olofsson discloses that "[t]he selection process (11) preferably includes . . . UE location, i.e., the geographic position for which measurement data is desired." Ex. 1006, 10:3–6. We agree with and find

credible Dr. Kotzin's testimony that one of ordinary skill would have understood from this disclosure of Olofsson that the system obtains the UE location information for the terminal(s) prior to selecting the terminal(s). Ex. 1003 ¶ 262. Based on this evidence, we find that Olofsson discloses obtaining location information prior to selecting the terminal(s), and that, in the proposed Olofsson-Kuruvilla combination, this would have been performed by the "information collector," as discussed above. *See* § II.D.4(b), *supra*. We disagree with Patent Owner's assertion that Olofsson's disclosure is insufficient because it only states that "'preferably' the UE location has to be taken into account during the selection process." PO Resp. 43. In order for the UE location to be taken into account during the selection process, the location has to be obtained before the actual selection occurs.

With respect to claim 4, Olofsson discloses associating the location information with at least one of the selected terminals. As Dr. Kotzin persuasively testifies, one of ordinary skill "would have understood for the information collector to perform the selection process based in part on UE location and then instruct the UE to obtain measurement information," the information collector "would be configured to associate the location information with at least one of the selected one or more terminals." Ex. 1003 ¶ 268. Olofsson also discloses that it was known for a UE's system to "receive[] and store[] the recorded call and GPS information and graphically display[] this information, along with a map indicating the location of the mobile telephone." Ex. 1006, 3:10–12. We agree with and find credible Dr. Kotzin's testimony that this disclosure further shows that one of ordinary skill "would have understood how to associate the UE's

location information with the selected UE, and would have understood Olofsson's disclosure as teaching such an association." Ex. 1003 ¶ 269.

We also find that Kuruvilla teaches the claimed associating function. Kuruvilla explains that "the system includes an associated mobile unit which has a global positioning system which is used in order to derive the location information," and "[t]he data collection module collects RF signal measurements and location information from multiple phones in response to a trigger." Ex. 1007 ¶¶ 8, 21. The system also "map[s] the precise location data of the radio frequency signal [of a mobile unit] representing the positioning of the mobile unit at a given time." *Id.* ¶ 9; *see id.* ¶¶ 15–16. We agree with and find credible Dr. Kotzin's testimony that one of ordinary skill would have understood from this evidence that the components of the system (which act as an "information collector" in the Olofsson-Kuruvilla combination) are "configured to associate the location information with at least one of the UEs." Ex. 1003 ¶¶ 270–271.

Additionally, we find that the Olofsson-Kuruvilla combination teaches "provid[ing] the location information associated with the at least one of the selected one or more terminals to the coverage estimator," as claim 4 also requires. Specifically, Olofsson discloses providing location information along with the signal measurements in the measurement report, which (as explained above) is ultimately provided to the entity responsible for evaluating the measurements. Ex. 1006, 14:10–12 ("If the UE is capable of receiving GPS (Global Positioning System) information, positioning information from a GPS receiver is preferably included with test results in a measurement report."); 17:27–29 ("measurement data is preferably combined with a geographical position of the measurement"); *see* Ex. 1003

¶ 282. Kuruvilla also discloses providing data (including the location information associated with selected terminals) to the post processing module (coverage estimator) via the data collection module. Ex. 1007 ¶ 56, Fig. 5; *see id.* ¶¶ 8, 9, 15–16, 18, 34, 54; Ex. 1003 ¶¶ 284, 286.

We disagree with Patent Owner's argument that Olofsson and Kuruvilla only disclose associating and sending location information "that is obtained when the measurement information is being collected," and not "initial location information obtained by the information collector prior to selecting the terminal to perform measurements," as the claim requires. *See* PO Resp. 45. As discussed above, Olofsson discloses obtaining location information from terminals prior to selection, and Olofsson and Kuruvilla both disclose sending location information along with measurements to an entity responsible for evaluating the information (the coverage estimator). Kuruvilla also discloses that the report generated by the post processing module "will allow a network administrator to know where mobile units 10A–10B are located during the time the trigger was activated" and, as discussed with respect to claim 2 above, the trigger in the Olofsson-Kuruvilla combination occurs prior to selection. *See* Ex. 1036 ¶ 61; § II.D.5, *supra*. Patent Owner points to no disclosure in Olofsson or Kuruvilla that the location information provided to the entity for evaluating the measurements cannot be the initial location information taken prior to selection, and must be location information at the time measurements are taken, and we see no such disclosure. *See* PO Resp. 44–47; PO Sur-reply 25–27. We agree with and find credible Dr. Kotzin's testimony that one of ordinary skill "would have understood based on the disclosure of Olofsson and Kuruvilla, that the information collector would have been configured to

provide location information from prior to selection to the post processing module or TES," because this testimony is consistent with the disclosures of the references. Ex. 1036 ¶ 61.

Additionally, we agree with Petitioner and Dr. Kotzin that the "location information" may include "cell-level location information," which Olofsson discloses being provided by the UE when it registers with the network, and that it also would have been obvious to provide this cell-level location information to the post processing network or coverage estimator. Ex. 1006, 8:16–17, 10:3–6, 14:14–15; Ex. 1036 ¶¶ 63–67.

For the above reasons, Petitioner has proven by a preponderance of the evidence that claims 3 and 4 would have been obvious based on the Olofsson-Kuruvilla combination.

7. Dependent Claim 5

Claim 5 depends from claim 1 and recites that "the information collector is further configured to provide location information valid upon obtaining the measurement information for at least one of the selected one or more terminals." Ex. 1001, 12:22–26.

Petitioner argues that the Olofsson-Kuruvilla combination discloses this limitation. Pet. 77–78. Specifically, Petitioner argues that, as explained for claim 4, Olofsson discloses providing location information along with the measurement information, and also argues that this location information was valid when obtained from the UEs. *Id.* at 77 (citing Ex. 1006, 14:6–17, 17:27–29). According to Petitioner, its argument "is consistent with the '089 [p]atent, which describes location information sent by the UE along with the measurement information as location information valid when the measurement information was obtained from the UE." *Id.* at 77–78 (citing

Ex. 1001, 9:20–33). Petitioner also contends that the Olofsson-Kuruvilla combination discloses corresponding structure in the form of an information collector configured to provide the claimed location information, and the combination teaches an interface to the communication link that carries the claimed location information. *Id.* at 78. Finally, Petitioner argues that one of ordinary skill "would have been motivated to modify Olofsson's system configured to provide the claimed location information with Kuruvilla's data collection module" for the reasons discussed above with respect to the motivation to combine the references. *Id.* (citing Pet. 22–31; Ex. 1003 ¶ 293).

Patent Owner does not provide separate argument for claim 5, and instead relies on its argument for claim 1. PO Resp. 48.

Based on the full trial record, we find that Petitioner has proven by a preponderance of the evidence that claim 5 (including the claimed function and corresponding structure) would have been obvious over the combination of Olofsson and Kuruvilla.

8. Independent Claims 11, 13, and 15

Independent claim 11 is similar to claim 1 but is generally directed to "[a] mobile user terminal for use in an automatic coverage assessment method" instead of "[a]n automatic coverage assessment system" as in claim 1. Ex. 1001, 13:8–55. Independent claims 13 and 15 are similar to claim 1 but are generally directed to "[a] network node for use in a telecommunications infrastructure comprising a first wireless access network and a second wireless access network." *Id.* at 14:25–48, 14:51–15:8. Petitioner relies on similar arguments for claims 11, 13, and 15 as for claim 1. Pet. 79–88, 90–91.

Patent Owner asserts that claims 11, 13, and 15 "have similar requirements as the 'information collector' and 'coverage estimator' elements of [c]laim 1, and have similar requirements in their preambles for the portion of the preamble of [c]laim 1" discussed in the Patent Owner Response. PO Resp. 13. Consequently, Patent Owner relies on its arguments for claim 1 for claims 11, 13, and 15. *Id.*

Based on the full trial record, for the reasons set forth in the Petition and with respect to claim 1, we find that Petitioner has proven by a preponderance of the evidence that claims 11, 13, and 15 would have been obvious over the combination of Olofsson and Kuruvilla.

9. Dependent Claim 14

Claim 14 depends from claim 13. Claim 13 recites "[a] network node for use in a telecommunications infrastructure comprising a first wireless access network and a second wireless access network," and claim 14 recites that the "coverage estimator is included within the network node." Ex. 1001, 14:25–27, 14:49–50.

Petitioner argues that Olofsson's TES is included within the network node because it is described as a "network entity" that is in "the base station of the target cell." Pet. 88 (citing Ex. 1006, 14:18–21; Ex. 1003 ¶ 333). Petitioner also asserts that Kuruvilla "discloses the coverage estimator (post processing module) in communication with the network 12, which comprises the data collection module." *Id.* at 89 (citing Ex. 1007 ¶ 34). Relying on the testimony of Dr. Kotzin, Petitioner argues that it would have been obvious to one of ordinary skill "for the coverage estimator to be included in Claim 13's network node" because, "[b]efore the time of the alleged invention, it was well known for a node to contain the functions of

the coverage estimator and the functions described in Claim 13." *Id.* Additionally, Petitioner argues that it would have been obvious to modify Olofsson's network node to contain both the information collector and coverage estimator functionality in order to reduce network signaling. *Id.* at 90 (citing Ex. 1006, 14:23–26; Ex. 1003 ¶ 336).

Patent Owner does not provide separate argument for claim 14, and instead relies on its arguments for claims 1 and 13. PO Resp. 48.

Based on the full trial record, we find that Petitioner has proven by a preponderance of the evidence that claim 14 would have been obvious over the combination of Olofsson and Kuruvilla.

III. CONCLUSION

For the reasons discussed above, Petitioner has proven, by a preponderance of the evidence, that the challenged claims are unpatentable, as summarized in the following table:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–5, 11, 13–15	103(a)	Olofsson, Kuruvilla	1–5, 11, 13–15	
Overall Outcome			1–5, 11, 13–15	

IV. ORDER

Accordingly, it is

ORDERED that claims 1–5, 11, and 13–15 of the '089 patent have been shown to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Eastern District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:21-cv-113	3/31/2021	Eastern District of Texas

PLAINTIFF	DEFENDANT
KONINKLIJKE KPN N.V.	TELEFONAKTIEBOLAGET LM ERICSSON and ERICSSON INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	RE48,089	7/7/2020	KONINKLIJKE KPN N.V.
2	8,881,235	11/4/2014	KONINKLIJKE KPN N.V.
3	9,253,637	2/2/2016	KONINKLIJKE KPN N.V.
4	9,549,426	11/10/2020	KONINKLIJKE KPN N.V.
5	9,667,669	5/30/2017	KONINKLIJKE KPN N.V.

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT
FINAL JUDGMENT FOR PLAINTIFF

CLERK	(BY) DEPUTY CLERK	DATE
David A. O'Toole	CH	9/7/22

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
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Paper 9
Date: May 25, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ERICSSON INC.,
Petitioner,

v.

KONINKLIJKE KPN N.V.,
Patent Owner.

IPR2022-00079
Patent RE48,089

Before KEVIN F. TURNER, ROBERT J. WEINSCHENK, and RUSSELL E. CASS, *Administrative Patent Judges.*

CASS, *Administrative Patent Judge.*

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. Background

Ericsson Inc. ("Petitioner") filed a Petition requesting an *inter partes* review of claims 1–5, 11, and 13–15 (the "challenged claims") of U.S. Patent No. RE48,089 (Ex. 1001, "the '089 patent"). Paper 2 ("Pet."). Koninklijke KPN N.V. ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp."). With our permission, Petitioner filed a reply to the Preliminary Response (Paper 7, "Prelim. Reply"), and Patent Owner filed a Sur-reply (Paper 8, "PO Sur-reply").

An *inter partes* review may not be instituted unless it is determined that "the information presented in the petition filed under section 311 and any response filed under section 313 shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314 (2018); *see also* 37 C.F.R § 42.4(a) (2020) ("The Board institutes the trial on behalf of the Director."). The reasonable likelihood standard is "a higher standard than mere notice pleading," but "lower than the 'preponderance' standard to prevail in a final written decision." *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 13 (PTAB Dec. 20, 2019) (precedential).

For the reasons provided below and based on the record before us, we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing the unpatentability of at least one of the challenged claims. Patent Owner has not persuaded us that we should exercise our discretion to deny institution of trial. Accordingly, we institute an *inter partes* review on all grounds set forth in the Petition.

B. Real Parties in Interest

Petitioner states that the real parties in interest are Ericsson Inc. and Telefonaktiebolaget LM Ericsson. Pet. 1. Patent Owner states that Koninklijke KPN N.V. is the real party in interest. Paper 3, 2.

C. Related Proceedings

The parties state that the '089 patent was asserted in *Koninklijke KPN NV v. Telefonaktiebolaget LM Ericsson*, Case No. 2-21-cv-00113 (E.D. Tex.) (the "Texas litigation"), which was filed on March 31, 2021. Pet. 1–2; Paper 3, 2.

D. The '089 Patent (Ex. 1001)

The '089 patent is directed to "a method and system for assessing coverage in a wireless access network." Ex. 1001, code (57). The background of the '089 patent explains that "[i]n order to provide adequate service to the clients, wireless operators constantly evaluate the coverage area of their wireless access networks." *Id.* at 1:34–36. This evaluation can be performed using "drive tests," which consist of measurement routes that are traversed by a measurement terminal often mounted on a vehicle. *Id.* at 1:46–51. The '089 patent explains that these drive tests have several drawbacks, including that they provide coverage assessment only along the measurement route, and are too costly for estimation of overall coverage. *Id.* at 1:67–2:3.

According to the '089 patent, the invention seeks to overcome these drawbacks by providing a system that uses "terminals capable of measurement and reporting across the different wireless access networks." Ex. 1001, code (56). An example of such a system is disclosed in Figure 3, reproduced below.

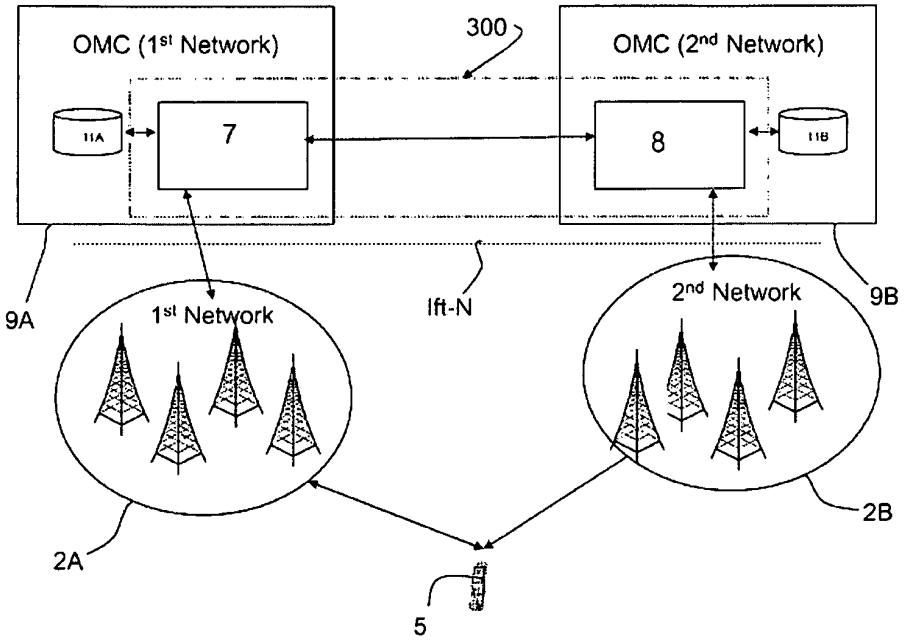


FIG. 3

Figure 3 shows a coverage assessment system according to one embodiment of the invention of the '089 patent. Ex. 1001, Fig. 3, 6:18–20.

Figure 3 depicts coverage assessment system 300, including information collector 7 and coverage estimator 8. Ex. 1001, 7:10–14. Information collector 7 "is configured for collecting information from some of the terminals 5 via the first wireless access network 2A and providing the information to the coverage estimator 8." *Id.* at 7:14–17. Coverage estimator 8 "is configured for connecting to and receiving information from the information collector and, based on the received information, generating the coverage assessment for the second wireless access network 2B." *Id.* at 7:17–21. In the embodiment shown in Figure 3, "information collector 7 is included with an [operation and maintenance center (]OMC[)] 9A of the first wireless access network 2A and the coverage estimator 8 is included within OMC 9B of the second wireless access network 2B." *Id.* at 7:22–26.

"Alternatively," the '089 patent explains, "the first and second wireless access networks 2A, 2B may share the same OMC." *Id.* at 7:26–27.

The '089 patent explains that information collector 7 and coverage estimator 8 "may be largely implemented as software executed by a processor and making use of memory," but may also "be implemented in hardware or a combination of software and hardware." Ex. 1001, 7:28–34.

A flow diagram of method steps for generating the coverage assessment is shown in Figure 4, reproduced below.

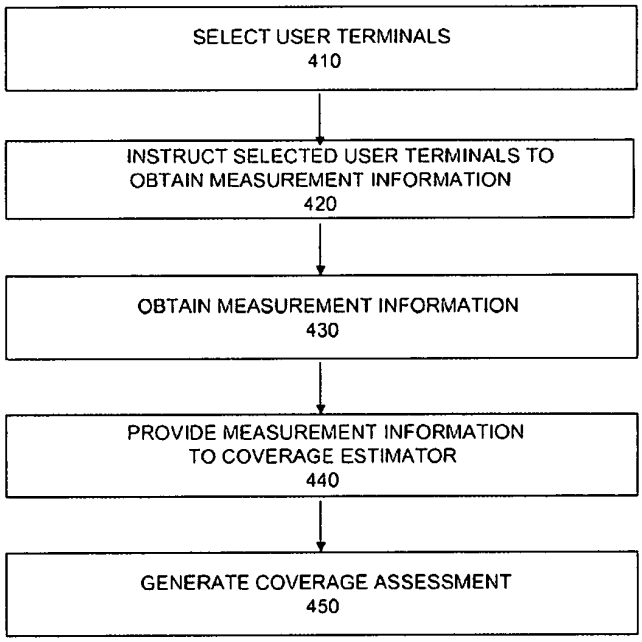


FIG. 4

Figure 4 is a flow diagram of method steps for generating a coverage assessment for a wireless access network. Ex. 1001, Fig. 4, 6:21–25.

In step 410, "information collector 7 selects one or more of the terminals 5 for obtaining measurement information." Ex. 1001, 8, 34–36. In step 420, "information collector 7 instructs the selected one or more terminals [from the first network] to measure signals from the [second] network." *Id.* at 8:66–9:1. In step 430, "information collector 7 obtains

measurements information indicative of the signals measured from the [second] network by the selected one or more terminals." *Id.* at 9:1–4. In step 440, "information collector 7 forwards the measurement information obtained from the selected terminals to the coverage estimator 8 within the [second] network." *Id.* at 9:62–65. Finally, in step 450, "coverage estimator 8 generates the coverage assessment for the [second] network based on the information obtained from the information collector." *Id.* at 10:11–13. The coverage assessment "is generated by assembling a coverage map, representing the geographic locations/pixels with associated signal strengths of the second network." *Id.* at 10:13–16.

E. Illustrative Claims

Of challenged claims 1–5, 11, and 13–15, claims 1, 11, 13, and 15 are independent. For purposes of the issues raised at this stage of the proceeding, claim 1 is illustrative and is reproduced below.

> 1. [preamble] An automatic coverage assessment system configured for generating a coverage assessment for a second wireless access network of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals, the system comprising:
>
> 1[a] an information collector; and
>
> 1[b] a coverage estimator;
>
> 1[a][i] wherein the information collector is configured to: (i) select one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network,
>
> 1[a][ii] (ii) instruct the selected one or more terminals to measure signals from the second wireless access network;

1[a][iii] (iii) obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals, and

1[a][iv] (iv) provide the measurement information to the coverage estimator, and

1[b][i] wherein the coverage estimator is configured to: (i) obtain measurement information from the information collector, and

1[b][ii] (ii) based on the obtained measurement information, generate the coverage assessment for the second wireless access network of the telecommunications infrastructure.

Ex. 1001, 11:44–12:6 (bracketed paragraph identifiers added).

F. Applied References

Petitioner relies upon the following references:

Olofsson, WO Pub. No. 2010/034157 A1, published Apr. 1, 2010 (Ex. 1006); and

Kuruvilla, US 2009/0181664 A1, published Jul. 16, 2009 (Ex. 1007).

Pet. v, 22–91. Petitioner also submits the Declaration of Dr. Michael Kotzin (Ex. 1003).

G. Asserted Grounds of Unpatentability

Petitioner challenges the patentability of claims 1–5, 11, and 13–15 of the '089 patent based on the following ground:

Claim(s) Challenged	35 U.S.C. §	References/Basis
1–5, 11, and 13–15	103(a)[1]	Olofsson, Kuruvilla

[1] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), included revisions to 35 U.S.C. § 103 that became effective

II. DISCUSSION

A. Discretion Under 35 U.S.C. § 314(a) Based on Related District Court Proceeding

In the Preliminary Response, Patent Owner contends that we should exercise our discretion to deny the Petition in favor of the Texas litigation. Prelim. Resp. 1–10.

The Board has held that the advanced state of a parallel district court action is a factor that may weigh in favor of denying a petition under § 314(a). *See NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 at 20 (PTAB Sept. 12, 2018) (precedential) ("*NHK*"); Patent Trial and Appeal Board Consolidated Trial Practice Guide (Nov. 2019), 58 & n.2, *available at* https://www.uspto.gov/TrialPracticeGuideConsolidated ("Trial Practice Guide"). We consider the following factors to assess "whether efficiency, fairness, and the merits support the exercise of authority to deny institution in view of an earlier trial date in the parallel proceeding":

> 1. whether the court granted a stay or evidence exists that one may be granted if a proceeding is instituted;
>
> 2. proximity of the court's trial date to the Board's projected statutory deadline for a final written decision;
>
> 3. investment in the parallel proceeding by the court and the parties;
>
> 4. overlap between issues raised in the petition and in the parallel proceeding;
>
> 5. whether the petitioner and the defendant in the parallel proceeding are the same party; and

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after the filing of thc application that led to the '089 patent. Therefore, we apply the pre-AIA version of 35 U.S.C. § 103.

> 6. other circumstances that impact the Board's exercise of discretion, including the merits.

Apple Inc. v. Fintiv Inc., IPR2020-00019, Paper 11 at 5–6 (PTAB March 20, 2020) (precedential) ("*Fintiv*"). In evaluating these factors, we "take[] a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review." *Id.* at 6.

We consider each of these factors below.

1. Factor 1 — Stay of Related Litigation Proceeding

It appears that neither party has requested a stay of the Texas litigation. Prelim. Resp. 2; Prelim. Reply 1. Given the particular circumstances of this case, we lack sufficient information to determine, at this stage, the likelihood that the district court might grant a motion to stay, should one be requested. *See Sand Revolution II, LLC v. Cont'l Intermodal Group – Trucking LLC*, IPR2019-01393, Paper 24 at 7 (PTAB June 16, 2020) (informative) ("*Sand Revolution*") ("In the absence of specific evidence, we will not attempt to predict how the district court in the related district court litigation will proceed because the court may determine whether or not to stay any individual case, including the related one, based on a variety of circumstances and facts beyond our control and to which the Board is not privy."). Accordingly, we determine that this factor does not weigh either for or against exercising our discretion to deny institution in this case.

2. Factor 2 — Proximity of Court's Trial Date

In its Preliminary Response, Patent Owner asserts that "the trial in the district court proceeding is currently scheduled to begin in August 2022, some 8 to 9 months before the Board's projected statutory deadline of late April to mid-May 2023 for a final written decision." Prelim. Resp. 5.

Petitioner argues that the trial date in the Texas litigation may be delayed because "[t]here are three other cases scheduled to commence jury selection on August 22, [2022] including a number of patent cases," and that "[i]t is reasonable to expect that some of these cases will be resolved prior to trial and others will be rescheduled for a later available month." Prelim. Reply 2 (citing Ex. 1023). "Indeed," Petitioner asserts, the district court in the Texas litigation "has already *sua sponte* moved the trial date—along with all deadlines including and after the *Markman* hearing deadline—back by two weeks." *Id.* (citing Ex. 1024, 1–4).

Although we recognize that there is a possibility that the currently scheduled trial date may slip, we also note the significant gap between the presently-scheduled trial date and the due date for our final written decision. Under these circumstances, we find that factor 2 weighs in favor of exercising discretion to deny institution.

3. Factor 3 — Investment in the Parallel Proceeding

Patent Owner argues that the parties and the district court have already invested significantly in the district court litigation because "[c]laim construction, all fact discovery, and potentially even all expert discovery will be complete before an institution may be issued." Prelim. Resp. 5. Patent Owner also states that the district court "issued a claim construction order on March 16, 2022." Prelim. Sur-reply 3.

Petitioner argues that it "diligently and promptly filed its Petition less than two months after it received Patent Owner's infringement contentions on September 15, 2021," and "*before* serving its initial invalidity contentions in the parallel district court litigation." Prelim. Reply 2–3. Petitioner further argues that the district court "invested minimal effort on invalidity issues

through its Claim Construction Memorandum and Order," and "will not have ruled on substantive motions—including dispositive motions, *Daubert* motions, and motions *in limine*—by the institution deadline, so the district court's involvement is otherwise directed to ancillary matters unrelated to the invalidity issue itself." *Id.* at 3.

We agree with Patent Owner that the parties have invested significant resources in the district court litigation, although it is unclear from the present record how much investment has been made by the district court on invalidity issues, particularly as to the '089 patent.[2] We also find that Petitioner was very diligent in filing the Petition within two months of receiving infringement contentions from Patent Owner in the litigation. Based on these facts, we determine that factor 3 weighs against exercising discretion to deny institution.

4. Factor 4 — Overlap With Issues Raised in the Parallel Proceeding

Patent Owner argues that the issues in this proceeding overlap with those in the district court litigation, and that "Petitioner's invalidity contentions in the district court litigation include the same main references that it relies upon here in its Petition: Olofsson and Kuruvilla." Prelim. Resp. 8–9 (citing Ex. 2007, 34, 36, 71, 72, 75–77).

In its Reply, Petitioner stipulates that, "if the Patent Trial and Appeal Board institutes an IPR in this proceeding on the grounds presented in the Petition, Petitioner will not pursue an invalidity defense in the district court action (C.A. No. 2:21-cv-113-JRG) that the patent claims subject to the instituted IPR are invalid based on the same grounds as in the petition or

[2] The Texas litigation involves five patents. *See* Ex. 1004, 6.

even on the references that are the bases for those grounds (*e.g.*, *Olofsson* and *Kuruvilla*)." Prelim. Reply 3–4. Petitioner argues that "[t]his stipulation eliminates any risk of overlapping effort and results." According to Petitioner, "such a stipulation 'mitigates any concerns of duplicative efforts between the district court and the Board, as well as concerns of potentially conflicting decisions,'" quoting *VMWare, Inc. v. Intellectual Ventures I LLC*, IPR2020-00470, Paper 13, 20 (PTAB August 18, 2020) "*VMWare*"). Prelim. Reply at 4. Petitioner further contends that the Petition involves independent claim 11, which is not at issue in the related district court litigation. *Id.*

Patent Owner responds by arguing that Petitioner's stipulation is not "a broad *Sotera*-type stipulation which includes 'any other ground' that could have been raised," as in *Sotera Wireless Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 at 13 (PTAB December 1, 2020) (precedential). Prelim. Sur-reply 4. Instead, according to Patent Owner, Petitioner's stipulation "is a weak 'same grounds' stipulation similar to the one the Board criticized in" *Sand Revolution*, Paper 24, at 12 n.5 (PTAB Jun. 16, 2020) (informative). *Id.* Patent Owner also argues that Petitioner has not filed its stipulation with the district court and has made no showing that its stipulation will be accepted or enforced by the district court. *Id.*

Petitioner's stipulation occupies an intermediate ground between the stipulations in *Sotera* and *Sand Revolution.* It is not as expansive as the stipulation in *Sotera* because it does not require Petitioner to relinquish all invalidity defenses that it could have raised in the IPR if the Petition is instituted. *See Sotera* at 13. However, it is stronger than the stipulation in *Sand Revolution* because it precludes Petitioner from relying in the district

court on any of the same *references* used in the Petition, and is not limited to only the same *grounds*. *See Sand Revolution* at 11–12. For example, under a *Sand Revolution*-type stipulation, a Petitioner may be able to maintain some degree of overlap between the two proceedings by relying on the same primary reference in an obviousness combination in both proceedings and using on one or more different secondary references in each proceeding. According to the stipulation made by Petitioner in this case, however, Petitioner cannot rely on *any* of the references relied on in the Petition in the district court litigation. We agree with Petitioner and with our prior decision in *VMWare v. Intellectual Ventures I* that Petitioner's stipulation here "mitigates any concerns of duplicative efforts between the district court and the Board, as well as concerns of potentially conflicting decisions." Prelim. Reply 4; *VMWare* at 20.

As to Patent Owner's argument that Petitioner has not filed its stipulation with the district court, we consider Petitioner's stipulation to be binding, just as it would be if filed as a separate document in this proceeding or in district court.

In light of the particular facts and circumstances of this case, we find that factor 4 weighs against exercising our discretion to deny institution.

5. Factor 5 — Commonality of Parties in the Parallel Proceedings

In *Fintiv*, we explained that "[i]f a petitioner is unrelated to a defendant in an earlier court proceeding, the Board has weighed this fact against exercising discretion to deny institution under *NHK*." *Fintiv* at 13–14. There is no dispute that Petitioner and Patent Owner are both parties to the Texas litigation. Prelim. Resp. 10; Prelim. Reply 4. Therefore, factor 5 weighs in favor of exercising discretion to deny institution.

6. Factor 6 — Other Circumstances

Petitioner argues that "[t]he strength of the Petition strongly favors institution," and that "Patent Owner's Preliminary Response makes rebuttal arguments regarding the individual prior art references set forth in the Petition rather than the combination of these references, so it does not sufficiently rebut the arguments made in the Petition." Prelim. Reply 5. Petitioner further argues that policy considerations support institution because even if the Petition had been filed on the same day as it was sued in the Texas litigation, "it would still have been unable to complete an IPR prior to the scheduled trial date." *Id.*

As discussed further below, we determine based on the present record that Petitioner has set forth a reasonably strong case on the merits. *See* § II.E, *infra*. Specifically, Petitioner has set forth persuasive reasons, based on the testimony of Dr. Kotzin, why one of ordinary skill would have been motivated to combine Olofsson and Kuruvilla, and how one of ordinary skill would have found the claimed invention obvious based on that combination. *Id.* We also disagree with Patent Owner's argument that Petitioner's combination does not teach the claimed "information collector" and "coverage estimator." Therefore, factor 6 weighs against exercising discretion to deny institution.

7. Conclusion

As noted in *Fintiv*, we consider the above factors as part of "a holistic view of whether efficiency and integrity of the system are best served by denying or instituting review." *Fintiv*, Paper 11 at 6. Under the particular circumstances presented here, we determine that Petitioner's diligence in filing this proceeding, its stipulation that mitigates the concerns of

duplicative efforts and potentially conflicting results, and the strength of the merits of the Petition, outweigh the factors that weigh in favor of exercising discretion. Considering the *Fintiv* factors as part of a holistic analysis, we are not persuaded that the interests of the efficiency and integrity of the system would be best served by invoking our authority under 35 U.S.C. § 314(a) to deny institution of trial.

B. Claim Construction

A claim "shall be 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) (2020).

1. "Coverage Assessment"

Petitioner proposes that the term "coverage assessment" be construed, "consistent with the specification's definition," to mean "a 'representation of locations/pixels and associated signal strengths.'" Pet. 16 (citing Ex. 1001, 5:20–22). Patent Owner does not dispute this definition in its preliminary response. We agree that Petitioner's proposed construction of "coverage assessment" is consistent with how that term is used in the '089 patent specification. *See* Ex. 1001, 5:20–22 (referring to "the coverage assessment (i.e., a representation of locations/pixels and e.g. associated signal strengths of the second wireless access network)"). Accordingly, we will apply Petitioner's construction of "coverage assessment" for purposes of this Decision.

2. "Information Collector"

Patent Owner argues that the term "information collector" must be construed to be "a ***distinct entity*** from the 'terminals'" and "must be configured to perform all four of the following actions: 'select one or more

terminals,' 'instruct the selected one or more terminals,' 'obtain measurement information . . . measured . . . by the selected one or more terminals,' and 'provide the measurement information to the coverage estimator.'" Prelim. Resp. 17–18.

Based on the present record, we agree with Patent Owner that the plain language of claim 1 expressly requires the "information collector" to perform the four actions identified by Petitioner. Ex. 1001, 11:53–66. We also preliminarily agree with Patent Owner that the claims recite an "information collector" that is distinct from the "terminals." *Id.* at 11:49–50 (reciting "a plurality of terminals"), 11:51 (reciting "an information collector"), 11:53–54 (reciting that the "information collector" is configured to "select one or more terminals").

3. "Means-Plus-Function" Limitations

Claims 11, 13, and 15 include a number of limitations that recite "means for" followed by a function, and Petitioner argues that Section 112, paragraph 6 applies to these limitations. Pet. 16–22. Petitioner also argues that claim 1 recites "that the 'information collector' and 'coverage estimator' are 'configured to' or 'car[y] out operations' to perform certain recited functionality, without reciting sufficient structure for performing those functions." *Id.* at 17. Petitioner further asserts that the terms "information collector" and "coverage estimator" are nonce terms subject to Section 112, paragraph 6. *Id.* (citing *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015)). Accordingly, Petitioner argues, these limitations of claim 1 also invoke Section 112, paragraph 6. *Id.* Patent Owner does not address the issue of whether the "information collector" and "coverage

estimator" claim elements invoke Section 112, paragraph 6. Prelim. Resp. 17–25.

Based on the present record and for purposes of this Decision, we will apply Petitioner's proposed constructions of the terms "information collector" and "coverage estimator" under Section 112, paragraph 6. Doing so is consistent with the claim construction order issued by the district court in the Texas litigation, which found that these claim elements invoke Section 112, paragraph 6. Ex. 1027, 33–35, 49.

Petitioner sets forth the following identifications of function and structure for the various claim elements that it interprets under Section 112, paragraph 6.

Selecting, Associating and Generating Limitations

Limitations	Structure and Function
13[a] "means for selecting one or more terminals . . . second wireless access network;" Limitations 1[a][i], 11[d][i], 15[c][i].	Function: select one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network Structure: processor implementing an algorithm to select one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network
4[a] "information collector is further configured to associate the	Function: associate the location information with at least one of the

location information with at least one of the selected one or more terminals"	selected one or more terminals Structure: processor implementing an algorithm that associates the location information with at least one of the selected one or more terminals
15[b] "means for generating the coverage assessment . . . measurement information" Limitations 1[b][ii], 11[f][ii], 13[e].	Function: generate the coverage assessment for the second wireless access network of the telecommunications infrastructure based on the obtained measurement information Structure: processor implementing an algorithm that generates the coverage assessment for the second wireless access network of the telecommunications infrastructure

Pet. 17–18. Petitioner asserts that the '089 patent "describes information collector 7 as generic 'software executed by a processor and making use of memory,' 'hardware or in a combination of software and hardware,' which would include one or more processors implementing an algorithm to perform these respective functionalities." *Id.* at 18 (citing Ex. 1003 ¶ 78; Ex. 1001, 7:29–35).

Instructing and Obtaining Limitations

Limitations	Structure and Function
13[b] "means for instructing the selected one or more terminals to measure signals from the second wireless access network" Limitations 1[a][ii], 11[d][ii], 15[c][ii].	Function: instruct the selected one or more terminals to measure signals from the second wireless access network Structure: interface of the first wireless access network that instructs the selected one or more terminals to measure signals from the second wireless access network
13[c] "means for obtaining measurement information . . . selected one or more terminals" Limitations 1[a][iii], 11[d][iii], 15[c][iii]	Function: obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals Structure: interface of the first wireless access network over which measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals are received
[3] "information collector is further configured to obtain location information . . . one or more terminals"	Function: obtain location information for at least one of the at least part of the plurality of terminals prior to selecting the one or more terminals Structure: interface of the first wireless access network over which location information for at least one of the at least part of the plurality of terminals is received

Pet. 18–19. Petitioner asserts that the '089 patent "consistently describes the generic information collector as communicating with terminals over the first wireless access network to instruct and obtain measurement information that the terminals collect from the second wireless access network." *Id.* at 19–20 (citing Ex. 1001, 2:25–36, 7:10–17, 9:16–19, 9:20–39). Petitioner further states that "[a]n interface of the first wireless access network performs the information collector's instructing and obtaining functionality." *Id.* at 20 (citing Ex. 1003 ¶ 79; Ex. 1001, 4:14–59, 6:1–3, 7:10–17, 7:59–61, 8:7–25, 8:65–9:19, Fig. 3).

Providing and Obtaining Limitations

Limitations	Structure and Function
13[d] "means for providing the measurement information to a coverage estimator" Limitations 1[a][iv], 11[d][iv], 15[c][iv].	Function: provide the measurement information to the [coverage estimator/network node] Structure: interface to the communication link that carries information to the [coverage estimator/ network node]
4[b] "information collector is further configured to . . . provide the location information . . . to the coverage estimator."	Function: provide the location information associated with the at least one of the selected one or more terminals to the coverage estimator Structure: interface to the communication link that carries the location information associated with the at least one of the selected one or more terminals to the coverage estimator
[5] "information collector is further configured to provide location information valid upon	Function: provide location information valid upon obtaining the measurement information for at

obtaining . . . one or more terminals."	least one of the selected one or more terminals Structure: interface to the communication link that carries location information valid upon obtaining the measurement information for at least one of the selected one or more terminals
15[a] "means for obtaining measurement information from an information collector" Limitations 1[b][i], 11[f][i].	Function: obtain measurement information from the information collector Structure: interface to the communication link that carries measurement information from the information collector

Pet. 20–21. Petitioner asserts that "[a]n interface to the communication link that carries information performs the claimed providing and obtaining functions." *Id.* at 21 (citing Ex. 1003 ¶ 80; Ex. 1001, 6:56–7:9, 7:23–28, 9:1–39, Fig. 3 (depicting generic communication link between information collector 7 and coverage estimator 8)).

Claim 11 Means-Plus-Function Terms

Limitations	Structure and Function
11[a] "means for measuring signals from the second wireless access network"	Function: measuring signals from the second wireless access network Structure: radio receiver of terminal 5 that measures signals from the second wireless access network
11[b] "means for providing . . . measured signals"	Function: providing the measurement information to at least one of an information collector or a coverage estimator based on the

	measured signals Structure: interface of terminal 5 to the first wireless access network over which measurement information based on the measured signals are sent

Pet. 21–22. Petitioner asserts that the '089 patent "identifies only terminal 5 with no internal components disclosed other than a radio terminal." *Id.* at 22 (citing Ex. 1001, 4:20–25, 6:39–44, 7:55–59, 7:65–67). Petitioner also argues that "[t]erminal 5 is therefore a radio terminal, and a radio receiver of terminal 5 performs the claimed measuring functionality." *Id.* (citing Ex. 1003 ¶ 82; Ex. 1015, 8). According to Petitioner, the "[i]nterface of terminal 5 to the first wireless access network therefore performs the claimed providing functionality." *Id.* (citing Ex. 1003 ¶ 82; Ex. 1001, 2:25–36, 6:1–12, 9:1–19, Fig. 3).

At this stage of the proceeding, we find that Petitioner has set forth an adequate identification of the functions performed by the alleged means-plus-function elements as well as sufficient structure in the specification for us to go forward with an analysis of unpatentability.

We determine that it is not necessary to provide an express interpretation of any other claim terms at this stage of the proceeding. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) ("[O]nly those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.").

C. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103(a) if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, objective evidence of non-obviousness.[3] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also "determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Whether a combination of prior art elements would have produced a predictable result weighs in the ultimate determination of obviousness. *Id.* at 416–417.

In an *inter partes* review, the petitioner must show with particularity why each challenged claim is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016); 37 C.F.R. § 42.104(b) (2020). The burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

[3] At this stage of the proceeding, Patent Owner has not presented objective evidence of non-obviousness.

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

D. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art at the time of the alleged invention "would be a person with a B.S. degree in electrical engineering, computer engineering, or equivalent training or job experience, with at least one to two years of experience in wireless communication technology, or a Master's degree in electrical engineering, computer engineering, or other equivalent degree." Pet. 11 (citing Ex. 1003 ¶ 65). Petitioner further states that "[a]dditional education could compensate for less practical experience and vice versa." *Id.* Patent Owner does not propose a level of ordinary skill in the art at this stage of the proceeding. *See generally* Prelim. Resp.

For purposes of this Decision, we adopt Petitioner's assessment of the level of ordinary skill in the art because we find it to be supported by the '089 patent and the asserted prior art.

E. Ground 1: Asserted Obviousness of Claims 1–5, 11, and 13–15 Based on Olofsson in view of Kuruvilla

Petitioner contends that claims 1–5, 11, and 13–15 would have been obvious over Olofsson in view of Kuruvilla. Pet. 22–91. Patent Owner disagrees, arguing that Petitioner has failed to establish that the prior art teaches or suggests various elements of the claims. Prelim. Resp. 26–46.

1. Overview of Olofsson (Ex. 1006)

Olofsson is directed to a system for "triggering of a user equipment to perform test or measurement of a target network from an originating network." Ex. 1006, code (57). Olofsson explains that field tests of cellular

networks typically "are accomplished with drive tests wherein an RF or cellular engineer drives a vehicle around in a designated area while making one or more telephone calls using his mobile cellular telephone." *Id.* at 3, 19–22. However, Olofsson explains, drive tests are "an extremely inefficient exercise, in terms of time, for an RF engineer." *Id.* at 4:10–12. Olofsson also explains that "[p]rior to open[ing] a communications system for public use and commercial services, most providers or operators would like to estimate their service quality and radio coverage provided." *Id.* at 5:2–4. Thus, according to Olofsson, "it would be of a great value to a wireless services provider, and in the end also to users of the services, if user equipment in public use could provide measurement data" for new networks using developing technology so that "coverage and service quality can be ensured prior to the new technology [being] made available for public services." *Id.* at 5:14–17.

To address this perceived need, Olofsson discloses a system including an originating network open for public use, a target network not yet open for public use, and user equipment devices (UEs) connected to the originating network that may be controlled to assist in testing of neighboring cells of the target network. Ex. 1006, 8:21–26. In Olofsson's system, an originating cell of the originating network informs selected UEs to measure a target cell. *Id.* at 9:9–12. In a densely populated area, the originating network preferably selects a subset of the available UEs to participate in the measurement. *Id.* at 10:20–22. The selection process can also consider the UE's capability for performing and reporting measurements and the UE's location. *Id.* at 10:3–6, 10.

The network signaling to the UE preferably includes information on what signals or parameters to measure or determine, and can include measurements for determining service quality and radio coverage. Ex. 1006, 12:24–27. UEs participating in the test measure signals of the new cell and send a report on the outcome of the measurement. *Id.* at 9:21–23. Olofsson discloses that measurement reports are preferably transmitted to a test evaluation server (TES) in the target cell. *Id.* at 14:18–21. However, Olofsson explains, measurement reports may also be transmitted to the originating cell, although doing so will require additional network signaling and communications that may drain the batteries of the UE. *Id.* at 14:23–26.

2. Overview of Kuruvilla (Ex. 1007)

Kuruvilla is directed to a system for identifying geographical areas where radio frequency coverage is poor. Ex. 1007, code (57). Kuruvilla explains that one "method of measuring RF coverage is to perform a drive test," but that this approach is "insufficient" because it requires technicians to physically visit multiple areas, it cannot achieve full coverage, and it does not reflect changing RF coverage due to construction and seasonal foliage. *Id.* ¶ 5. To overcome this problem, Kuruvilla provides a communication network that uses mobile units to make measurements, an embodiment of which is shown in Figure 1, reproduced below.

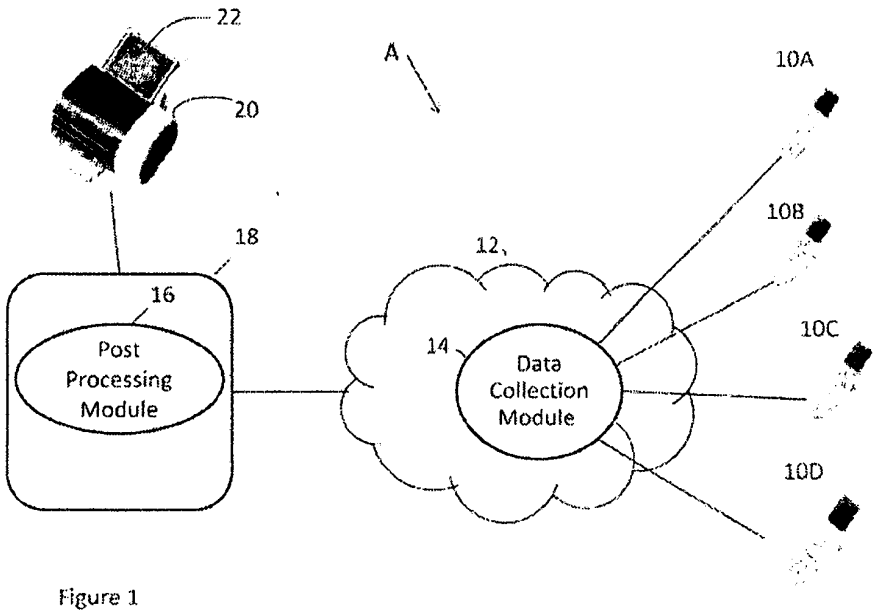


Figure 1

Figure 1 depicts Kuruvilla's system for determining network coverage. Ex. 1007, Fig. 1

As shown in Figure 1, "communications infrastructure A includes a plurality of mobile units 10A, 10B, 10C, 10D," that "are in communication with a network provider 12." Ex. 1007 ¶¶ 32, 34. Network provider 12 "includes a data collection module 14." *Id.* "The data collection module collects RF signal measurements and location information from multiple mobile phones in response to a trigger." *Id.* ¶ 8. Data collection module 14 is "in communication with a post processing network element 18," which includes "a post processing module" 16. *Id.* ¶¶ 32, 34. The "post processing module plots the RF coverage information on a map using data uploaded from the data collection module." *Id.* ¶ 8. "A wireless provider may use this information in order to correct RF coverage problems." *Id.*

3. Motivation to Combine Olofsson With Kuruvilla

Petitioner provides several reasons why one of ordinary skill would have been motivated to combine Olofsson with Kuruvilla to arrive at the claimed invention. Pet. 22–31. Relying on Dr. Kotzin, Petitioner argues

that Olofsson and Kuruvilla "are in the same field of endeavor" and "are directed to solving the same problem—evaluating coverage of a network in a more efficient manner than conventional drive tests by using measurement information from existing UEs." Pet. 23 (citing Ex. 1003 ¶¶ 111, 133, 160, 187, 215, 236, 252, 274; Ex. 1006, 5:14–6:9, 8:25–9:4; Ex. 1007 ¶¶ 5–6). Petitioner also asserts that both systems "are very similar," and "evaluate coverage by instructing and leveraging existing UEs to obtain signal information from neighboring networks." *Id.* (citing Ex. 1003 ¶¶ 112, 131, 161, 188, 216, 237, 253, 275; Ex. 1006, 9:8–14, 1011–17, Fig. 1; Ex. 1007 ¶¶ 8, 34, 36, 45, 48, 50, 53, 56, Fig. 3). Petitioner further argues that "both are directed to evaluating network coverage using improved techniques over conventional drive tests." *Id.* at 23 (citing Ex. 1003 ¶¶ 113, 135, 162, 189, 217, 238, 254, 276; Ex. 1006, 3:13–4:15, 5:14–6:9, 8:25–9:4; Ex. 1007 ¶¶ 5–6).

As for the implementation details, Petitioner argues that one of ordinary skill "would have been motivated to combine Olofsson's system involving two wireless access networks with Kuruvilla's data collection module and post processing module." Pet. 24 (citing Ex. 1003 ¶¶ 111–119, 133–140, 160–176, 186–204, 214–223, 236–244, 252–259, 274–280). According to Petitioner, Olofsson "teaches selecting and instructing UEs to take measurements, and transmitting the measurement information to the entity responsible for evaluating measurements, the test evaluation server (TES)." Pet. 24. Petitioner also argues that Olofsson teaches "the UE providing its location information to the TES in the measurement report" and "evaluating the measurement information obtained by the UEs." *Id.* (citing Ex. 1006, 14:6–17, 14:19–21, claim 4). According to Petitioner, one

of ordinary skill considering Olofsson "would have been motivated to look to similar references, such as Kuruvilla for implementation details of the data collection module component instructing and obtaining measurement and location information from the UEs and transmitting it to the entity responsible for evaluating the measurements, as well as the implementation details of the coverage estimator evaluating the measurement information to generate a coverage assessment, such as a coverage map." *Id.* at 24–25 (citing Ex. 1003 ¶¶ 114, 136, 163, 190, 218, 239; Ex. 1006, 5:14–17, 5:22–6:3, 6:10–13, 7:19–21).

Petitioner further argues that one of ordinary skill would have had a reasonable expectation of success in combining Olofsson and Kuruvilla, and would have been further motivated to make the combination because it would achieve the benefit of improving coverage while avoiding the problems with drive tests. Pet. 26–31.

Patent Owner does not specifically challenge Petitioner's motivation to combine Olofsson and Kuruvilla. Prelim. Resp. 26–46. Based on the present record, we determine that Petitioner has presented sufficient evidence, including testimony from Dr. Kotzin, to show a reasonable likelihood that one of ordinary skill would have been motivated to combine Olofsson and Kuruvilla as Petitioner proposes.

4. Analysis of Independent Claim 1

a) 1[preamble]: "[a]n automatic coverage assessment system configured for generating a coverage assessment for a second wireless access network of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals"

Petitioner asserts that, to the extent the preamble of claim 1 is limiting, the Olofsson-Kuruvilla combination discloses it. Pet. 31–34. Petitioner argues that Olofsson "discloses an originating network (first wireless access network) and a target network (second wireless access network) providing telecommunication services." *Id.* at 31 (citing Ex. 1006, Abstract, 8:18–20). Petitioner contends that "[t]he first and second networks are capable of providing service to a plurality of terminals." *Id.* at 31–32 (citing Ex. 1006, 7:14–19, 8:1–9, 9:1–4). Petitioner also argues that Olofsson discloses an automatic coverage assessment system configured for generating a coverage assessment of the second wireless network in which UEs provide measurement data to allow for evaluation of coverage and service quality. *Id.* at 32 (citing Ex. 1006, 5:14–17, 5:22–6:3, 6:10–13). Petitioner argues that Kuruvilla also discloses an automatic coverage assessment system configured for generating a coverage assessment. *Id.* at 33.

Patent Owner does not present argument directed to the preamble of claim 1. Prelim. Resp. 26–46.

We determine that, on the record before us, Petitioner's cited evidence sufficiently supports its contentions regarding the preamble at this stage of the proceeding.[4]

b) 1[a]: "an information collector;"

1[a][i]: "wherein the information collector is configured to: (i) select one or more terminals from at least part of the plurality of the terminals capable of communicating with both the first wireless network and the second wireless network;"

1[a][ii]: "(ii) instruct the selected one or more terminals to measure signals from the second wireless access network;"

1[a][iii]: "(iii) obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals; and"

1[a][iv]: "(iv) provide the measurement information to the coverage estimator"

Petitioner argues that the combination of Olofsson and Kuruvilla teaches these limitations. Pet. 34–59. With respect to limitation 1[a][i], Petitioner argues that "Olofsson discloses 'select[ing] at least or more terminals from at least part of the plurality of the terminals.'" *Id.* at 34–35 (citing Ex. 1006, Fig. 1). Petitioner also asserts that these terminals are selected from "the at least part of the plurality of terminals capable of communicating with both the first wireless access network and the second wireless access network." *Id.* at 35. According to Petitioner, Olofsson's originating network is the claimed "first wireless access network" and Olofsson's target network is the claimed "second wireless access network,"

[4] Because we are persuaded that Petitioner has shown that the prior art teaches the subject matter recited in the preamble, we need not decide whether the preamble is limiting for purposes of this Decision.

and Olofsson discloses terminals capable of communicating with both networks. *Id.* at 35–37 (citing Ex. 1006, 8:18–20, 9:1–4, 9:9–12, 16:11–17:4).

Petitioner also argues that in the Olofsson-Kuruvilla combination this selection is performed by an "information collector." Pet. 38–40. According to Petitioner, one of ordinary skill "would have understood that one or more components of Olofsson's originating network performs the claimed selecting step." *Id.* at 38 (citing Ex. 1006, 9:9–12, Fig. 1; Ex. 1003 ¶ 129). Petitioner also argues that Kuruvilla discloses an "information collector" in the form of data collection module 14, which "collects RF signal measurements and location information from multiple mobile phones" and "is a component of the network." *Id.* (citing Ex. 1007 ¶¶ 8, 20, 34, 36, Fig. 1). Petitioner contends that one of ordinary skill "would have been motivated to modify one or more components of Olofsson's originating network to include Kuruvilla's data collection module" for the reasons discussed above in the section addressing motivation to combine. *See* § II.E.3, *supra*. Petitioner further contends that the combination discloses a processor implementing an algorithm to perform the claimed selecting function, or equivalents thereof. Pet. 39–40 (citing Ex. 1006, 9:8–9, 18:6–7, 18:23–17; Ex. 1007 ¶ 8; Ex. 1003 ¶ 132).

With respect to limitation 1[a][ii], Petitioner argues that Olofsson "discloses 'instruct[ing] the selected one or more terminals to measure signals from the second wireless access network.'" Pet. 40. Specifically, Petitioner argues that Olofsson "discloses 'inform[ing] . . . selected UEs . . . to measure on a target cell [second wireless access network],' where '[o]ne required selection criteria is UEs to support the radio access technology . . .

of the target network.'" *Id.* (citing Ex. 1006, 9:8–14, Fig. 1 (step 12)). According to Petitioner, these "instructions instruct the UEs to measure received signals of the second wireless access network" in order "to determine service quality and radio coverage." *Id.* at 41–42 (citing Ex. 1006, 10:7–10, 12:12–15, 12:24–13:10). Petitioner further argues that, in the Olofsson-Kuruvilla combination, one of ordinary skill would have understood that "one or more components of the originating network (information collector) would instruct the terminals via an interface of the first wireless access network." *Id.* at 42–43 (citing Ex. 1006, 2:8–10, 9, 21–23, 14:1–3; Ex. 1003 ¶ 146).

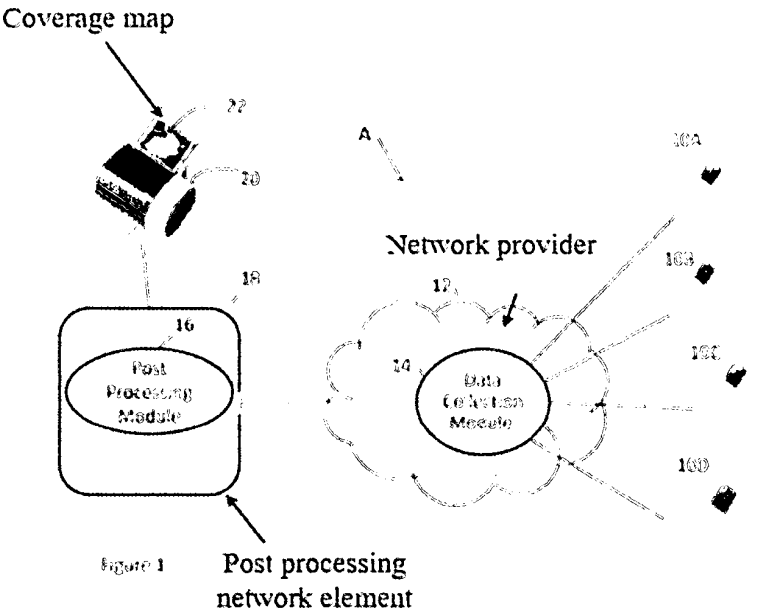
With respect to limitation 1[a][iii], Petitioner argues that the Olofsson-Kuruvilla combination discloses "obtain[ing] measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals." Pet. 43–55. Specifically, Petitioner argues that Olofsson discloses that UEs should measure signals of the target cell (second wireless access network) based on signaled instructions from the originating network. *Id.* at 43–44 (citing Ex. 1006, 14:1–3, Fig. 1). Petitioner also asserts that Olofsson discloses that "[t]he selected UEs perform and report such signal measurements of the target network." *Id.* at 44–45 (citing Ex. 1006, 9:8–14, 9:16–18, 10:3–6, 10:11–17, Fig. 1). Petitioner further argues that Kuruvilla's "'data collection module [information collector] collects RF signal measurements." *Id.* at 47–49 (citing Ex. 1007 ¶¶ 8, 34, 36, 48, 53, Fig. 3).

Additionally, Petitioner argues that the Olofsson-Kuruvilla combination teaches an "information collector" that is "configured to perform the claimed obtaining functionality." Pet. 49. Petitioner argues

that, in Olofsson's system, "the UE can send the measurement report to the originating network," and one of ordinary skill would have understood that "one or more components of Olofsson's originating network selects the UEs and instructs the selected UEs to measure information from the target network." *Id.* (citing Ex. 1006, 14:23–26; Ex. 1003 ¶ 157). In light of these disclosures, Petitioner asserts, one of ordinary skill would have found it obvious "for the one or more components of Olofsson's originating network that selected and instructed the UEs to measure information (information collector) to also obtain the requested measurement information from those UEs." *Id.* (citing Ex. 1003 ¶ 157). According to Petitioner, one of ordinary skill would have been motivated to modify Olofsson in this way because it would be efficient for "the component that instructed the UEs to take the measurements to also obtain the measurement reports from the UEs." *Id.* at 50 (citing Ex. 1003 ¶ 158).

Petitioner also argues that one of ordinary skill "would have been motivated to combine Olofsson's system with Kuruvilla's data collection module obtaining the measurement information" such that "the UE transmits the measurement report to the data collection module or information collector of the originating network." Pet. 50–51 (citing Ex. 1006, 14:18–15:3; Ex. 1003 ¶¶ 167, 194). Additionally, Petitioner contends, it would have been obvious to combine Olofsson and Kuruvilla so that "Kuruvilla's data collection module reside[es] in Olofsson's target network," and have the "UE transmit[] the measurement report to the data collection module or information collector residing in the target network." Pet. 51 (citing Ex. 1006, 14:18–15:3, 12:6; Ex. 1003 ¶¶ 168, 196).

With respect to limitation 1[a][iv], Petitioner argues that the Olofsson-Kuruvilla combination "discloses 'provid[ing] the measurement information to the coverage estimator.'" Pet. 56–59. Petitioner states that Olofsson "discloses providing the measurement information to the 'entity being responsible for evaluating the measurements'" (Olofsson's test evaluation server (TES)), but "does not expressly disclose an information collector configured to provide the measurement information to the coverage estimator." *Id.* at 56 (citing Ex. 1006, 14:19–21; Ex. 1003 ¶ 181). Petitioner argues that Kuruvilla discloses "providing the measurement information to the coverage estimator" as shown by post processing module 16. *Id.* at 56–57 (citing Ex. 1007 ¶¶ 31, 36, 56, Fig. 5 (step 505)). According to Petitioner, Kuruvilla discloses a communication link between the data collection module and post-processing module, highlighted in yellow in Petitioner's annotated version of Kuruvilla's Figure 1, reproduced below:



Petitioner's annotated version of Kuruvilla's Figure 1 with the communication link between data collection module 14 and post-processing module 16 highlighted in yellow. Pet. 58 (citing Ex. 1007, Fig. 1, ¶ 34).

Petitioner also argues that Olofsson "expressly discloses interfaces to the communications network infrastructure," and one of ordinary skill "would have understood that the communication link between the information collector and coverage estimator similarly would comprise an interface for providing and obtaining information." *Id.* at 59 (citing Ex. 1006, 2:8–10; Ex. 1003 ¶ 185).

Patent Owner argues that Olofsson does not teach the claimed "information collector." Prelim. Resp. 27–32. First, Patent Owner asserts that Petitioner merely relies on "unspecified" components of the originating network to perform the "selecting" and "instructing" steps, and that the fact that these components are unspecified in Olofsson "is reason enough for the Board to deny institution." *Id.* at 27, 31–32. Second, Patent Owner argues that the "obtain[ing] measurement information" and "provid[ing]" the measurement information to a coverage estimator are performed by the *terminals* (UEs), rather than by an "information collector." *Id.* at 27–28. More specifically, according to Patent Owner, Olofsson's terminals (which are separate from the information collector) report the results of their measurements to the test evaluation server (TES), which is the entity responsible for evaluating those measurements. *Id.* (citing Ex. 1006, 14:18–26, 18:6–27).

Third, Patent Owner also argues that Olofsson teaches away from the claims by stating that, when the terminals transmit measurement reports to the target network "'there is ***no need*** for the originating network to connect to the test evaluation server of the target cell.'" *Id.* at 29 (quoting Ex. 1006, 14:21–23 (emphasis added)). Patent Owner also points to Olofsson's statement that transmission of measurement reports to the originating cell

would add "'the expense of additional network signaling and communications relations, among other things draining batteries of battery powered UEs.'" *Id.* at 30 (quoting Ex. 1006, 14:23–26). "Instead," Patent Owner contends, "Olofsson prefers to have the measurement reports from the terminals 'transmitted (14) to a base station of the target network' so that the 'measurement reports received are processed in a test evaluation server' (TES), which is preferably 'connected (58) directly to the base station unit (52).'" *Id.* (citing Ex. 1006, 14:21–22, 18:11–12, 18:21–22, Fig. 5).

Fourth, Patent Owner argues that Kuruvilla does not remedy Olofsson's deficiencies because it "provides no teaching of having a component, distinct from the terminals, perform all four of the above functions—and if combined with Olofsson would at most only teach providing measurement information, which had already been sent from the *terminals* to a test evaluation server, to a coverage map printer." Prelim. Resp. 32–33. According to Patent Owner, "merely adding the subsequent step of providing information from the test evaluation server of Olofsson to a 'coverage map printer' of Kuruvilla would not, in short, change the fact that Olofsson fails to teach the 'information collector' of Claim 1." *Id.* at 33–34.

Based on the present record, Petitioner has presented sufficient evidence at this stage of the proceeding that one of ordinary skill would have found the "information collector" elements to be obvious over Olofsson and Kuruvilla. Petitioner has sufficiently shown that it would have been obvious to one of ordinary skill that components exist in Olofsson's originating network that select terminals capable of communicating with the originating and target networks and instruct those terminals to measure signals from the

second wireless access network. We also agree that Petitioner has presented sufficient evidence at this stage that one of ordinary skill would have found it obvious for the terminals to report the measurement information back to the components within the originating network that selected and instructed the terminals, such as is performed in Kuruvilla's data collection module 14. These components within the originating network could be considered an "information collector." We also agree that it would have been obvious based on Olofsson and Kuruvilla, for this "information collector" to provide the measurement information collected from the terminals to an entity that estimates coverage, such as Kuruvilla's post processing module 16 or Olofsson's test evaluation server (TES), which would function as a "coverage estimator."

Based on the present record, we do not agree with Patent Owner's arguments. First, we do not agree with Patent Owner's argument that Petitioner merely relies on "unspecified" components of Olofsson's originating network to perform the "selecting" and "instructing" steps. The '089 patent describes the "information collector" as being "largely implemented as software executed by a processor and making use of memory" or being "implemented in hardware or in a combination of software and hardware." Ex. 1001, 7:29–35. Petitioner similarly relies on Olofsson's hardware and software components as performing the "selecting" and "instructing" steps. Pet. 38 (citing Ex. 1006, 9:9–12, Fig. 1; Ex. 1003 ¶ 129); *id.* at 42–43 (citing Ex. 1006, 2:8–10, 9:21–23, 14:1–3; Ex. 1003 ¶ 146).

Second, we do not agree with Patent Owner's argument that in Olofsson the "obtain[ing] measurement information" and "provid[ing]" that

information to a coverage estimator are performed by the *terminals* rather than an "information collector." Petitioner does not rely on Olofsson alone for these elements, but rather relies on the combination of Olofsson with Kuruvilla's data collection module 14, which both instructs the terminals and collects measurements from them, before sending those measurements to a post processing module for estimating coverage. Patent Owner's argument thus considers Olofsson individually rather than the combination relied on by Petitioner. However, one cannot defeat a showing of obviousness by merely attacking the references individually where, as here, the arguments are based on combinations of references. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

Third, we disagree with Patent Owner's argument that Olofsson "teaches away" from having the terminals send the measurement information to an "information collector" in the originating network because Olofsson states that sending the information to the TES in the target network is preferred, and that sending the information to the originating network may require additional signaling. Prelim. Resp. 29–30. As the Federal Circuit has explained, "[a] statement that a particular combination is not a preferred embodiment does not teach away absent clear discouragement of that combination." *Syntex (U.S.A.) LLC v. Apotex, Inc.*, 407 F.3d 1371, 1380 (Fed. Cir. 2005). At this stage of the proceeding, we do not find Olofsson's preference for sending the measurement information to the target network to be a "clear discouragement" of sending measurement information to the originating network instead.

Finally, we disagree with Patent Owner's argument that Kuruvilla does not teach a component distinct from the terminals that performs all four

of the recited functions of the "information collector." Prelim. Resp. 32–33. Petitioner does not rely on Kuruvilla for the "select[ing]" and "instruct[ing] functions, or for the use of terminals connected to first and second networks, but instead relies on Olofsson for those limitations. Thus, Patent Owner is attacking Kuruvilla individually rather than relying on the Olofsson-Kuruvilla combination relied on by Petitioner. *See Keller*, 642 F.2d at 425.

For the foregoing reasons, and based on the present record, Petitioner has demonstrated a reasonable likelihood that the combination of Olofsson and Kuruvilla teaches limitations 1[a][i]–1[a][iv].

c) *1[b]: "a coverage estimator;"*

1[b][i]: "wherein the coverage estimator is configured to: (i) obtain measurement information from the information collector, and"

1[b][ii]: "(ii) based on the obtained measurement information, generate the coverage assessment for the second wireless access network of the telecommunications infrastructure;"

Petitioner argues that the combination of Olofsson and Kuruvilla teaches these limitations. Pet. 59–67. Petitioner asserts that Olofsson "discloses a coverage estimator as the 'test evaluation server, TES,' which is 'a network entity being responsible for evaluating measurements.'" *Id.* at 61 (citing Ex. 1006, 14:19–21, 24:8–9). According to Petitioner, the TES "generates a coverage assessment" of the second wireless access network "by processing and evaluating UEs' measurement reports (obtained measurement information) to determine service quality and radio coverage." *Id.* at 63–64 (citing Ex. 1006, 4:22–5:18).

"Additionally," Petitioner contends, "Kuruvilla discloses a coverage estimator as a post processing module," that "is configured to receive the

collected data and generate a report, such as coverage map 22." *Id.* at 61–62 (citing Ex. 1007 ¶ 40, Fig. 1), 64–65. The report may be used "to 'show[] coverage area network problems,' and 'determine geographic areas where signal strengths are poor.'" *Id.* at 65 (citing Ex. 1007 ¶ 50). Petitioner further argues that the Olofsson-Kuruvilla combination teaches "an interface to the communication link that carries measurement information from the information collector, or equivalents thereof." *Id.* at 62.

In terms of structure, Petitioner argues that Olofsson discloses that the TES "comprises 'processing circuitry' for processing the measurement reports," and Kuruvilla "discloses that the post processing module is a 'software module.'" *Id.* at 66 (citing Ex. 1006, 18:11–13; Ex. 1007 ¶¶ 8, 33).

Patent Owner argues that the Olofsson-Kuruvilla combination fails to teach the "coverage estimator." Prelim. Resp. 34–36. Patent Owner asserts that "Olofsson provides no teaching regarding what its 'test evaluation server' *does* with the reported measurements, stating only that '[m]easurement reports received are processed in a test evaluation server, TES.'" *Id.* at 34 (citing Ex. 1006, 18:11–13). Patent Owner further argues that Kuruvilla "is unable to generate a coverage assessment for a 'second' wireless access network," but rather "teaches generating a coverage map for a single network, from measurements within that network." *Id.* at 34–35 (citing Ex. 1007 ¶ 34, Fig. 1).

Based on the current record, we determine that Petitioner has made a sufficient showing that the Olofsson-Kuruvilla combination teaches the claimed "coverage estimator." We determine that Petitioner has sufficiently shown that it would have been obvious to one of ordinary skill that

Olofsson's TES acts as "coverage estimator" because it is "responsible for evaluating the measurements" from the UEs, and Olofsson suggests that a purpose of the invention is to allow providers or operators "to estimate their service quality and radio coverage provided." Ex. 1006, 5:2–4, 14:19–21. We also agree with Petitioner that Kuruvilla's post-processing module is a "coverage estimator" because it receives the collected data and generate[s] a report, such as coverage map 22, which may be used to show coverage area network problems. Ex. 1007 ¶¶ 40, 50. We further agree with Petitioner that one of ordinary skill would have found it obvious based on these disclosures of Olofsson and Kuruvilla to have a "coverage estimator" entity that receives the measurement information from the "information collector" (discussed in § II.E.4(a)) and determines a coverage estimate.

We do not agree with Patent Owner's arguments that Olofsson does not sufficiently describe the operation of the TES and Kuruvilla does not disclose a second wireless access network because these arguments attack the references individually, rather than the proposed combination. *See Keller,* 642 F.2d at 425. In particular, Petitioner does not rely on Kuruvilla to teach that the coverage assessment is for the second wireless access network, but rather relies on Olofsson for that claim limitation.

For the foregoing reasons, and based on the present record, Petitioner has demonstrated a reasonable likelihood that the combination of Olofsson and Kuruvilla teaches limitations 1[b][i]–1[b][ii].

d) Summary for Claim 1

For the foregoing reasons, we are persuaded that Petitioner's cited evidence and reasoning demonstrates a reasonable likelihood that Petitioner would prevail in its contentions regarding claim 1.

5. Dependent Claim 2

Claim 2 depends from claim 1, and further recites that the system "comprises a trigger configured for triggering the information collector to select the one or more terminals." Ex. 1001, 12:7–10. Petitioner argues that Olofsson "discloses triggering UEs to perform measurements of the target network," but "does not expressly disclose a trigger configured for triggering the information collector to *select* the one or more terminals." Pet. 67 (citing Ex. 1006, Abstract, 20:6–8; Ex. 1003 ¶ 246). Petitioner argues that Kuruvilla discloses the use of a trigger for initiating the disclosed method and trigger the data collection module to collect the measured data from the UEs. *Id.* (citing Ex. 1007 ¶¶ 8–9, 41). Relying on Dr. Kotzin, Petitioner argues that it would have been obvious to one of ordinary skill to modify Kuruvilla's trigger to be configured for triggering the information collector to select the one or more terminals. *Id.* at 69 (citing Ex. 1003 ¶¶ 250–251).

Patent Owner argues that the Petition and Dr. Kotzin "merely provide an empty *assertion* that it would have been obvious to modify Kuruvilla's trigger, which, as in Olofsson, is actually a trigger to *perform measurements*, to be a trigger to *select* the one or more terminals." Prelim. Resp. 37 (citing Pet. 69; Ex. 1003 ¶¶ 250–251).

Based on the present record, we determination that Petitioner has made a sufficient showing that claim 2 is obvious over the Olofsson-Kuruvilla combination at this stage of the proceeding. Specifically, Kuruvilla discloses that the disclosed method "begins with the trigger", and that the method instructs the UEs to measure signals. Ex. 1007 ¶ 41. Dr. Kotzin also testifies that "[i]t would have been obvious to a person of ordinary skill in the art that if the information collector instructs only selected UEs to measure signals and must first perform the selection, that the

trigger would apply to the information collector selecting the UEs." Ex. 1003 ¶ 251. For these reasons, we are persuaded that Petitioner's cited evidence and reasoning demonstrates a reasonable likelihood that Petitioner would prevail in its contentions regarding claim 2.

6. Dependent Claims 3 and 4

Claim 3 depends from claim 1, and recites that "the information collector is further configured to obtain location information for at least one of the at least part of the plurality of terminals prior to selecting the one or more terminals." Ex. 1001, 12:11–15. Claim 4 depends from claim 3, and recites that "the information collector is further configured to associate the location information with at least one of the selected one or more terminals and provide the location information associated with the at least one of the selected one or more terminals to the coverage estimator." *Id.* at 12:16–21.

Petitioner argues that Olofsson's UEs "comprise a GPS or other positioning system to determine location interaction, and Olofsson "expressly discloses that '***[t]he selection process (11) preferably includes . . . UE location***, i.e., the geographical position for which measurement data is desired.'" Pet. 69–70 (quoting Ex. 1006, 10:3–6 (emphasis added); citing Ex. 1006, 17:29–18:4). Therefore, Petitioner argues, the information collector obtains the UE location "prior to selecting the one or more terminals, since UE location is taken into account as part of the selection process." *Id.* at 70 (citing Ex. 1003 ¶ 262). Petitioner also argues that "[f]or the information collector to include UE location in the selection process and then instruct the UE to obtain measurement information," the information collector "would be configured to associate the location information with at least one of the selected one or more

terminals." *Id.* at 71 (citing Ex. 1003 ¶ 268). Additionally, Petitioner argues that Olofsson teaches providing the UE location with the signal measurements in the measurement report, which is ultimately provided to the TES. *Id.* at 74 (citing Ex. 1006, 14:6–17, 17:27–29).

Petitioner further argues that Kuruvilla discloses the claimed functionality, because its data collection module (information collector) receives location information from the UEs, which includes a mobile identification number, and maps the precise mobile location data at a given time. Pet. 72 (citing Ex. 1007 ¶¶ 8–9, 15–16, 18, 21). Additionally, according to Petitioner, Kuruvilla discloses providing data, including the location information associated with selected terminals, to the post-processing module (coverage estimator) via the data collection module (information collector). *Id.* at 74 (citing Ex. 1007 ¶ 56).

Patent Owner argues that the Olofsson and Kuruvilla do not teach "initial location information that is obtained 'prior to' selecting the terminals." Prelim. Resp. 38. Patent Owner asserts that "the mere statement in Olofsson that the selection process of the terminals takes into account a geographical position for which measurement data is 'desired'" does not establish "that an information collector is configured to 'obtain' location information for terminals 'prior to selecting' them." *Id.* "Rather," Patent Owner contends, "Olofsson merely indicates a general intention to take into account where it is 'desired' to take measurements, and not to *obtain* any such location information 'prior to' selecting them." *Id.* at 38–39.

Based on the present record, we agree with Petitioner that the Olofsson-Kuruvilla combination discloses claims 3 and 4. Specifically, Olofsson states that "[t]he selection process (11) preferably includes . . . UE

location, i.e. the geographical position for which measurement data is desired." Ex. 1006, 10:3–6. Petitioner also introduces the testimony of Dr. Kotze that one of ordinary skill would have understood from this disclosure in Olofsson "that the information collector obtains the UE location information for at least one of the at least part of the plurality of terminals prior to selecting the one or more terminals, if UE location is taken into account as part of the selection process." Ex. 1003 ¶ 262. At this stage of the proceeding, we determine that this evidence is sufficient to show that Olofsson teaches that the location information for one or more terminals is obtained as part of the selection process, which means that the terminal's location would be obtained prior to the actual selection of that terminal. Thus, we are persuaded that Petitioner's cited evidence and reasoning demonstrates a reasonable likelihood that Petitioner would prevail in its contentions regarding claims 3 and 4.

7. Independent Claims 11, 13, and 15

Claims 11, 13, and 15 are similar to claim 1 in many respects, and Petitioner relies on similar arguments and evidence as for claim 1. Pet. 79–88, 90–91. Patent Owner does not present separate argument directed to claims 11, 13, and 15. For the reasons set forth with respect to claim 1, we determine that Petitioner has demonstrated a reasonable likelihood of unpatentability of claims 11, 13, and 15. *See* § II.E.4, *supra.*

8. Dependent Claim 14

Claims 14 depends from claim 13. Claim 13 recites "[a] network node for use in a telecommunications infrastructure comprising a first wireless access network and a second wireless access network," and claim

14 recites that the "coverage estimator is included within the network node." Ex. 1001, 14:25–27, 14:49–50.

Petitioner argues that Olofsson's TES is included within the network node because it is described as a "network entity" that is in "the base station of the target cell." Pet. 88 (citing Ex. 1006, 14:18–21; Ex. 1003 ¶ 333). Petitioner also asserts that Kuruvilla "discloses the coverage estimator (post processing module) in communication with the network 12, which comprises the data collection module." *Id.* at 89 (citing Ex. 1007 ¶ 34). Relying on the testimony of Dr. Kotzin, Petitioner argues that it would have been obvious to one of ordinary skill "for the coverage estimator to be included in Claim 13's network node" because, "[b]efore the time of the alleged invention, it was well known for a node to contain the functions of the coverage estimator and the functions described in Claim 13." *Id.* Additionally, Petitioner argues that it would have been obvious to modify Olofsson's network node to contain both the information collector and coverage estimator functionality in order to reduce network signaling. *Id.* at 90 (citing Ex. 1006, 14:23–26; Ex. 1003 ¶ 336).

Patent Owner argues that Olofsson's teaching "of having the *terminals* transmit to the test evaluation server (TES)—which Petitioner equates with the coverage estimator—means that Olofsson does *not* show the 'information collector' elements of Claim 13 as being in the same 'network node' as the component that Olofsson identifies as the coverage estimator, namely the test evaluation server." Prelim. Resp. 43–44. Patent Owner also argues that in Kuruvilla "the data collection module and the post processing network element 18 are taught as *separate* modules, not within the same network node." *Id.* at 44 (citing Ex. 1007, Fig. 1).

Based on the present record, we determine that Petitioner has presented sufficient evidence at this stage of the proceeding, including the testimony of Dr. Kotzin, that it would have been obvious to one of ordinary skill to include the information collector and coverage estimator in the same network node in order to reduce network signaling. Accordingly, we determine that Petitioner has demonstrated a reasonable likelihood of unpatentability of claim 14.

9. Dependent Claim 5

Petitioner contends that dependent claim 5, which depends from claim 1, would have been obvious over Olofsson and Kuruvilla. Pet. 77–78. Patent Owner does not provide any separate argument against claim 5 at this stage of the proceeding. Prelim. Resp. 26–46. Based on the present record, we determine that Petitioner has established a reasonable likelihood of unpatentability of claim 5.

III. CONCLUSION

After considering the evidence and arguments presented in the current record, we determine that Petitioner has demonstrated a reasonable likelihood of success in proving that at least one of the challenged claims of the '089 patent is unpatentable. Patent Owner has not persuaded us to exercise our discretion to deny institution of trial. We therefore institute trial on all challenged claims and grounds raised in the Petition.

At this stage of the proceeding, we have not made a final determination as to the patentability of any challenged claim or as to the construction of any claim term. Any final determination will be based on the record developed during trial. We place Patent Owner on express notice that any argument not asserted in a timely-filed Response to the Petition, or

in another manner permitted during trial, shall be deemed waived, even if that argument was presented in the Preliminary Response.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–5, 11, and 13–15 of the '089 patent is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4(b), *inter partes* review of the '089 patent shall commence on the entry date of this Order, and notice is hereby given of the institution of a trial.

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United States Patent and Trademark Office
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/224,047	07/07/2020	RE48089	12-678-REI	7372

20306 7590 06/17/2020

MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP
300 S. WACKER DRIVE
32ND FLOOR
CHICAGO, IL 60606

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Extension or Adjustment under 35 U.S.C. 154 (b)

A reissue patent is for "the unexpired part of the term of the original patent." See 35 U.S.C. 251. Accordingly, the above-identified reissue application is not eligible for Patent Term Extension or Adjustment under 35 U.S.C. 154(b).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Ljupco Jorguseski, Rijswijk, NETHERLANDS;
Koninklijke KPN N.V., Rotterdam, NETHERLANDS, Assignee (with 37 CFR 1.172 Interest);
Remco Litjens, Voorschoten, NETHERLANDS;
Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO, s'Gravenhage, NETHERLANDS
Haibin Zhang, The Hague, NETHERLANDS;
Adrian Victor Pais, Rijswijk, NETHERLANDS;

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/224,047	12/18/2018	3992	4540	12-678-REI	15	6

CONFIRMATION NO. 7372

CORRECTED FILING RECEIPT

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Date Mailed: 04/17/2020

Receipt is acknowledged of this reissue patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Inventor(s)

Ljupco Jorguseski, Rijswijk, NETHERLANDS;
Remco Litjens, Voorschoten, NETHERLANDS;
Haibin Zhang, The Hague, NETHERLANDS;
Adrian Victor Pais, Rijswijk, NETHERLANDS;

Applicant(s)

Koninklijke KPN N.V., Rotterdam, NETHERLANDS, Assignee (with 37 CFR 1.172 Interest);
Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO, s'Gravenhage, NETHERLANDS

Assignment For Published Patent Application

Nederlandse Organisatie voor Toegepast-Natuurweten schappelijk Onderzoek TNO, s'Gravenhage, NL

Power of Attorney: The patent practitioners associated with Customer Number 20306

Domestic Priority data as claimed by applicant

This application is a REI of 13/516,905 06/18/2012 PAT 8626175
which is a 371 of PCT/EP2010/069908 12/16/2010

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
EUROPEAN PATENT OFFICE (EPO) 09180130.8 12/21/2009 No Access Code Provided

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Permission to Access Search Results: Yes

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If Required, Foreign Filing License Granted: 01/30/2019
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/224,047**
Projected Publication Date: None, application is not eligible for pre-grant publication
Non-Publication Request: No
Early Publication Request: No
Title

Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

Preliminary Class

455

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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20306 7590 04/09/2020

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David A. Grabelsky	(Typed or printed name)
/David A. Grabelsky/	(Signature)
April 16, 2020	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/224,047	12/18/2018	Ljupco Jorguseski	12-678-REI	7372

TITLE OF INVENTION: Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	07/09/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
LIE, ANGELA M	3992	455-446000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 McDonnell Boehnen
2 Hulbert & Berghoff LLP
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE	(B) RESIDENCE: (CITY and STATE OR COUNTRY)
Koninklijke KPN N.V.	Rotterdam, Netherlands

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

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5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /David A. Grabelsky/ Date April 16, 2020

Typed or printed name David A. Grabelsky Registration No. 59,208

Electronic Patent Application Fee Transmittal

Application Number:	16224047
Filing Date:	18-Dec-2018
Title of Invention:	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks
First Named Inventor/Applicant Name:	Ljupco Jorguseski
Filer:	David A. Grabelsky/Carol Neth
Attorney Docket Number:	12-678-REI

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
REISSUE ISSUE FEE	1511	1	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1000**

Electronic Acknowledgement Receipt

EFS ID:	39175535
Application Number:	16224047
International Application Number:	
Confirmation Number:	7372
Title of Invention:	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks
First Named Inventor/Applicant Name:	Ljupco Jorguseski
Customer Number:	20306
Filer:	David A. Grabelsky
Filer Authorized By:	
Attorney Docket Number:	12-678-REI
Receipt Date:	16-APR-2020
Filing Date:	18-DEC-2018
Time Stamp:	11:48:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1000
RAM confirmation Number	E20204FB49099420
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	12-678-REI_IssueFeePayment.pdf	1622435 f624eee1807840af25e957cde877c0ed5997dee8	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30518 0d2fee809cd9cc4d5401822c7a9226e3ae4e2941	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1652953		

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20306 7590 04/09/2020

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EXAMINER	
LIE, ANGELA M	
ART UNIT	PAPER NUMBER
3992	

DATE MAILED: 04/09/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/224,047	12/18/2018	Ljupco Jorguseski	12-678-REI	7372

TITLE OF INVENTION: Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	07/09/2020

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

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If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

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II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

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(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/224,047	12/18/2018	Ljupco Jorguseski	12-678-REI	7372

TITLE OF INVENTION: Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	07/09/2020

EXAMINER	ART UNIT	CLASS-SUBCLASS
LIE, ANGELA M	3992	455-446000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/224,047	12/18/2018	Ljupco Jorguseski	12-678-REI	7372

20306 7590 04/09/2020

MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP
300 S. WACKER DRIVE
32ND FLOOR
CHICAGO, IL 60606

EXAMINER	
LIE, ANGELA M	
ART UNIT	**PAPER NUMBER**
3992	

DATE MAILED: 04/09/2020

Determination of Patent Term Extension or Adjustment under 35 U.S.C. 154 (b)

A reissue patent is for "the unexpired part of the term of the original patent." See 35 U.S.C. 251. Accordingly, the above-identified reissue application is not eligible for Patent Term Extension or Adjustment under 35 U.S.C. 154(b).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/224,047	Applicant(s) Jorguseski et al.	
	Examiner ANGELA M LIE	Art Unit 3992	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to filing submitted on 12/18/2018.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-15 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☑ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☑ Certified copies of the priority documents have been received in Application No. 13/516,905 .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☑ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 12/18/18 and 2/21/20.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/ANGELA M LIE/ Primary Examiner, Art Unit 3992	/SAMUEL G RIMELL/ Primary Examiner, Art Unit 3992

Notice of Pre-AIA or AIA Status.

The present application is being examined under the pre-AIA first to invent provisions.

Reissue

Applicant is reminded of the continuing obligation under 37 CFR 1.178(b), to timely apprise the Office of any prior or concurrent proceeding in which Patent No. 8,626,175 is or was involved. These proceedings would include interferences, reissues, reexaminations, and litigation.

Applicant is further reminded of the continuing obligation under 37 CFR 1.56, to timely apprise the Office of any information which is material to patentability of the claims under consideration in this reissue application.

These obligations rest with each individual associated with the filing and prosecution of this application for reissue. See also MPEP §§ 1404, 1442.01 and 1442.04.

Allowable Subject Matter

Claims 1-15 are allowed.

The following is an examiner's statement of reasons for allowance:

The prior art of record does not anticipate nor render obvious following features present in the independent claims 1, 6, 11, 12, 13 and 15.

With respect to claims 1, 11, 13 and 15, the prior are of record does not anticipate nor render obvious the automatic coverage assessment system comprising a first wireless access network and a second wireless access

network, the first and second wireless access networks capable of providing services to a plurality of terminals, the node comprising: means for selecting one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network; means for instructing the selected one or more terminals to measure signals from the second wireless access network, means for obtaining measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals; and means for providing the measurement information to a coverage estimator, wherein the coverage estimator is configured to generate the coverage assessment for the second wireless access network of the telecommunications infrastructure based on the measurement information provided by the network node.

With respect to claims 6 and 12, the automatic coverage assessment method for a second wireless access network of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals, the method comprising: (i) collecting, at an information collector, information from terminals by: selecting one or more terminals from at least part of the

plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network, instructing the selected one or more terminals to measure signals from the second wireless access network, obtaining measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals, and providing the measurement information to a coverage estimator; and (ii) generating, at the coverage estimator, the coverage assessment for the second wireless access network by: obtaining the measurement information from the information collector, and based on the obtained measurement information, generating the coverage assessment for the second wireless access network of the telecommunications infrastructure.

With respect to claims 2-5, 7-10, those claims are allowed by the virtue of their dependency on claims 1 and 6 respectively.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Relevant Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- US Patent No. 9,113,362 to Zhang et al teaches monitoring network estimating coverage and usage-based limitations to a wireless communications
- US Patent No. 8,514,776 to Robinson et al teaches a wireless network metric region in a wireless network is determined using a node metric region and performance metric
- US Patent No. 7,949,346 to Capuzzello et al teaches a method of locating terminal in a local wireless telecommunications network adapted to provide an estimated position of the terminal depending on a set of configuration data and a set of measuring data indicating whether the terminal belongs to a subset of the coverage areas and acquired from the terminal or network.
- US Publication No. 2004/0002328 to Chandra et al also cited and used as X reference in the international search report teaches User equipment assisted system database update wherein UEs (i.e. terminals) may be able to access multiple wireless networks and report data about coverage back to a base station. However as shown in figure 2, base station (information collector) does not select one or more terminals from at least part of the plurality of the terminals communicating with first and second wireless access networks and instructing the selected one or more terminals to measure signals from the second wireless access network. In contrast Chandra teaches UE

transmitting data to base station without being selected and/or instructed to do so.

- WO2009093960 to Mehdi et al teaches gathering data about a network and forwarding it to another node, but there is no explicit teaching about selecting one or more terminals and instructing it/them to measure signals of a second wireless network.

Inquiry

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANGELA M LIE whose telephone number is (571)272-8445. The examiner can normally be reached on M-F, 5:30 am - 2:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexander Kosowski can be reached on 571-272-3744.

All correspondence relating to this *reissue* proceeding should be directed:

By EFS-Web: Registered Users may submit correspondence via EFS-Web, at https://efs.uspto.gov/efile/myportal/efs-registered.

By Mail to: Mail Stop *Reissue*
Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

By FAX to: (571) 273-9900
Central Reexamination Unit

By hand: Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

EFS-Web offers the benefit of quick submission to the particular area of the Office that needs to act on the correspondence. Also, EFS-Web submissions are “soft-scanned” (i.e., electronically uploaded) directly into the official file for the Reissue proceeding, which offers parties the opportunity to review the content of their submission after the "soft scanning" process is complete.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ANGELA M LIE/
Primary Examiner, Art Unit 3992

Conferees:

/SAMUEL G RIMELL/
Primary Examiner, Art Unit 3992

/ALEXANDER J KOSOWSKI/
Supervisory Patent Examiner, Art Unit 3992

Notice of References Cited	Application/Control No. 16/224,047	Applicant(s)/Patent Under Reexamination Jorguseski et al.	
	Examiner ANGELA M LIE	Art Unit 3992	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-9113362-B2	08-2015	Zhang; Ming	H04W24/08	1/1
*	B	US-8514776-B2	08-2013	Robinson; Joshua P.	H04L41/147	370/328
*	C	US-7949346-B2	05-2011	Capuzzello; Alessandro	H04W64/00	455/456.1
*	D	US-20040002328-A1	01-2004	Chandra, Arty	H04W8/18	455/422.1
	E					
	F					
	G					
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	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
*	N	WO-9731502-A1	08-1997	WO	FRODIGH CARL MAGNUS	H04W36/30
*	O	EP-2076093-A1	07-2009	EP	LENGLET ROMAIN	H04W24/10
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/224,047	Jorguseski et al.
	Examiner	Art Unit
	ANGELA M LIE	3992

CPC - Searched*		
Symbol	Date	Examiner
H04W16/18	03/30/2020	A.M.L
H04W24/06	03/30/2020	A.M.L

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
reviewed prosecution history of US Patent No. 8,626,175	03/26/2020	A.M.L
keyword search, see attached search history report	03/26/2020 - 4/2/2020	A.M.L

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
H04W	16/18	04/02/2020	A.M.L
H04W	24/06	04/02/2020	A.M.L

/ANGELA M LIE/ Primary Examiner, Art Unit 3992	

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/224,047	Jorguseski et al.
	Examiner	**Art Unit**
	ANGELA M LIE	3992

CPC						
Symbol					**Type**	**Version**
H04W	/	16	/	18	F	2013-01-01
H04W	/	24	/	06	A	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	15	
/ANGELA M LIE/ Primary Examiner, Art Unit 3992	02 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/224,047	Jorguseski et al.
	Examiner	Art Unit
	ANGELA M LIE	3992

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H04W	/	40	/	00	
NON-CLAIMED					
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US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
455	446

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					
455	422.1	450	418	423		

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	15	
/ANGELA M LIE/ Primary Examiner, Art Unit 3992	02 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

U.S. Patent and Trademark Office

Part of Paper No.: 20200327

Samsung Ex. 1002, Page 152 of 356

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/224,047	Jorguseski et al.
	Examiner	**Art Unit**
	ANGELA M LIE	3992

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		10												
	2		11												
	3		12												
	4		13												
	5		14												
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	9														

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	15	
/ANGELA M LIE/ Primary Examiner, Art Unit 3992	02 April 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	3

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/224,047	Jorguseski et al.
	Examiner	Art Unit
	ANGELA M LIE	3992

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47										
CLAIM		DATE								
Final	Original									
	1									
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	15									

United States Patent And Trademark Office	**Application No.** 16/224,047	**Art Unit** 3992
Reissue Terminal Disclaimer Review Form	**Examiner** ANGELA M LIE	**AIA Status** No

Original Patent Number of Patent to be Reissued is: 8626175	**The Maintenance fee status is:** ◉ up to date ○ not up to date (Consult with SPRS)

Is there a terminal disclaimer filed and accepted during the prosecution of (i) the current reissue application, (ii) the underlying patent, and/or (iii) reexamination proceeding(s) of the underlying patent?

◉ NO
○ YES (Complete the rest of the form)

The reissue patent is subject to Terminal Disclaimer(s) that was/were:

☐ filed and accepted (DISQ or DISQ.E.FILE) during the prosecution of the current reissue application. (Enter terminal disclaimer(s) filing date(s) below).

1. _____ 2. _____ 3. _____

The underlying patent of the current reissue application is subject to Terminal DIsclaimer(s) that was/were:

☐ accepted (DISQ or DISQ.E.FILE) and of record in the prosecution of the underlying patent and/or reexamination procceeding(s) of the underlying patent. (Enter application/control no(s) and terminal disclaimer(s) filing date(s) below).

1. _____ _____ 2. _____ _____ 3. _____ _____

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16/224,047
Filing Date	2018-12-18
First Named Inventor	Jorguseski, Ljupco
Art Unit	3992
Examiner Name	Angela M. Lie
Attorney Docket Number	12-678-REI

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/A.M.L/	1	8301162	B2	2012-10-30	Ward	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/A.M.L/	1	20080051129	A1	2008-02-28	Abe et al.	
/A.M.L/	2	20040002328	A1	2004-01-01	Chandra et al.	
/A.M.L/	3	20070004394	A1	2007-01-04	Chu et al.	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
/A.M.L/	1	WO1997/31502	WO		1997-08-28	Telefonaktiebolaget LM Ericsson		

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2018-12-18
	First Named Inventor	Jorguseski, Ljupco
	Art Unit	
	Examiner Name	
	Attorney Docket Number	12-678-REI

/A.M.L/	2	EP2076093	EP	A1	2009-07-01	France Telecom		

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/A.M.L/	1	PCT International Search Report and Written Opinion, PCT International Application No. PCT/EP2010/069908 dated May 13, 2011.	
/A.M.L/	2	European Search Report, European Patent Application No. 09180130.8 dated August 9, 2010.	
/A.M.L/	3	"3rd Generation Partnership ProJect: Technical Specification Group Radio Access Network; Stage 2 Functional Specification of Location Services in UTRAN", 3G TS 25.305 V2.0.0., December 1999, pp. 1-38.	

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Signature	/David A. Grabelsky/	Date (YYYY-MM-DD)	2018-12-18
Name/Print	David A. Grabelsky	Registration Number	59,208

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Filing Date	2018-12-18
First Named Inventor	Jorguseski, Ljupco
Art Unit	3992
Examiner Name	Lie, Angela M
Attorney Docket Number	12-678-REI

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	("8626175").PN.	USPAT; USOCR	OR	OFF	2020/03/18 16:51
S2	2	(("20080051129") or ("8301162")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/03/20 13:56
S3	313	(wire$1less near2 network) with coverage with (measur$4 or collect$4)	USPAT	OR	OFF	2020/03/20 17:08
S4	39	S3 same (assess$5 or estimat$5 or apprais$5)	USPAT	OR	OFF	2020/03/20 17:09
S5	1	("7443135").PN.	USPAT; USOCR	OR	OFF	2020/03/26 10:55
S6	1	("8626175").PN.	USPAT; USOCR	OR	OFF	2020/03/27 15:41
S7	1	("9113362").PN.	USPAT; USOCR	OR	OFF	2020/03/27 16:10
S8	2	(("8514776") or ("7949346")).PN.	USPAT; USOCR	OR	OFF	2020/03/27 16:17
S9	1157	H04W16/18.cpci.	USPAT	OR	OFF	2020/03/27 17:44
S10	723	H04W24/06.cpci.	USPAT	OR	OFF	2020/03/27 17:44
S11	4	(("8301162") or ("20080051129") or ("20040002328") or ("20070004394")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/03/30 15:02
S12	17469	(base near station) with (request$4 or select$4 or appoint$4) with (terminal or "ue" or node)	USPAT	OR	OFF	2020/03/31 15:56
S13	3319	S12 same ((information or data) with network)	USPAT	OR	OFF	2020/03/31 15:59
S14	831	S12 same ((information or data) with network with wire$1less)	USPAT	OR	OFF	2020/03/31 16:00
S15	458	S14 and coverage	USPAT	OR	OFF	2020/03/31 16:14

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L1	1160	H04W16/18.cpci.	USPAT	OR	OFF	2020/04/02 15:09
L2	727	H04W24/06.cpci.	USPAT	OR	OFF	2020/04/02 15:09

4/2/2020 3:15:46 PM
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CONFIRMATION NO. 7372

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
16/224,047	12/18/2018 RULE	455	3992	12-678-REI

APPLICANTS

Koninklijke KPN N.V., Rotterdam, NETHERLANDS, Assignee (with 37 CFR 1.172 Interest);

INVENTORS

Ljupco Jorguseski, Rijswijk, NETHERLANDS;
Remco Litjens, Voorschoten, NETHERLANDS;
Haibin Zhang, The Hague, NETHERLANDS;
Adrian Victor Pais, Rijswijk, NETHERLANDS;

**** CONTINUING DATA ***************************

This application is a REI of 13/516,905 06/18/2012 PAT 8626175
which is a 371 of PCT/EP2010/069908 12/16/2010

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EUROPEAN PATENT OFFICE (EPO) 09180130.8 12/21/2009

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Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☑ Yes ☐ No	☑ Yes ☐ No	/ANGELA M LIE/ Examiner's Signature	☐ Initials	NETHERLANDS	4	15	6

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CHICAGO, IL 60606
UNITED STATES

TITLE

Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

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	1	WO2009093960	WO	A1	2009-07-30	Telefonaktiebolaget L M Ericsson (PUBL)		

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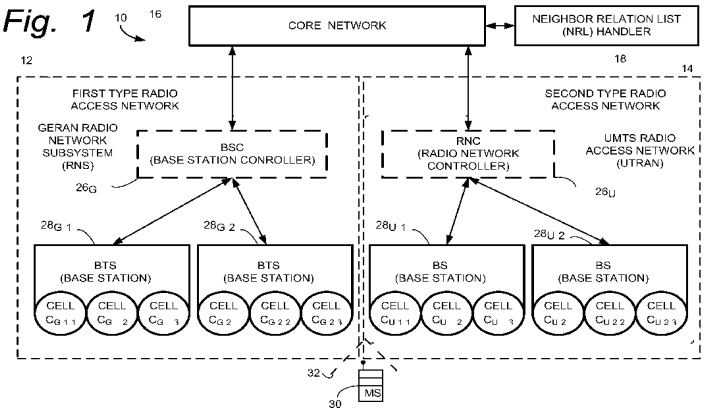
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(54) **Title:** INTER-RAT/FREQUENCY AUTOMATIC NEIGHBOR RELATION LIST MANAGEMENT

Fig. 1



(57) **Abstract:** In one of its aspects the technology concerns a method of operating a telecommunications system (10) comprising a serving radio base station (50_s) and a candidate radio base station (50_c). The serving radio base station (50_s) comprises a radio base station to which a wireless mobile station (30) provides measurement reports. The serving radio base station (50_s) and the candidate radio base station (50_c) are different with respect to at least one of frequency and radio access technology. The method comprises the serving radio base station (50_s) allowing the mobile station (30) to obtain information broadcasted by the candidate radio base station (50_c). The information is either information for locating Cell Global Identity (CGI) of the candidate radio base station (50_c) or the Cell Global Identity (CGI) itself of the radio base station. The mobile station (30) obtains the information from the candidate radio base station (50_c) during at least one reading gap. The reading gap is a time period in which the mobile station (30) does not receive information from the serving radio base station (50_s).

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INTER-RAT/ FREQUENCY AUTOMATIC NEIGHBOR RELATION LIST MANAGEMENT

[0001] This application claims the priority and benefit of United States Provisional Patent application 61/023,469, filed January 25,2008 and entitled "Inter-RAT/ Frequency Automatic Neighbor Relation List Management", which is incorporated herein by reference in its entirety.

BACKGROUND

I. TECHNICAL FIELD

[0002] This invention pertains to telecommunications, and particularly an inter-radio access technology (IRAT) and inter-frequency measurement(s) involved with neighbor relation list management.

II. RELATED ART AND OTHER CONSIDERATIONS

[0003] In a typical cellular radio system, wireless terminals (also known as mobile stations and/or user equipment units (UEs)) communicate via a radio access network (RAN) to one or more core networks. The wireless terminals can be mobile stations or user equipment units (UE) such as mobile telephones ("cellular" telephones) and laptops with wireless capability), e.g., mobile termination), and thus can be, for example, portable, pocket, hand-held, computer-included, or car-mounted mobile devices which communicate voice and/or data with radio access network.

[0004] The radio access network (RAN) covers a geographical area which is divided into cell areas, with each cell area being served by a base station, e.g., a radio base station (RBS), which in some networks is also called "NodeB" or "B node". A cell is a geographical area where radio coverage is provided by the radio base station equipment at a base station site. Each cell is identified by a identity within the local radio area, which is broadcast in the cell. The base stations communicate over the air interface operating on radio frequencies with the user equipment units (UE) within range of the base stations.

[0005] In some versions (particularly earlier versions) of the radio access network, several base stations are typically connected (e.g., by landlines or microwave) to a radio network controller (RNC). The radio network controller, also sometimes termed a base station controller (BSC), supervises and coordinates various activities of the plural base stations connected thereto. The radio network controllers are typically connected to one or more core networks.

[0006] The Universal Mobile Telecommunications System (UMTS) is a third generation mobile communication system, which evolved from the Global System for Mobile Communications (GSM) and is intended to provide improved mobile communication services based on Wideband Code Division Multiple Access (WCDMA) access technology. UTRAN is essentially a radio access network using wideband code division multiple access for user equipment units (UEs). The Third Generation Partnership Project (3GPP) has undertaken to evolve further the UTRAN and GSM based radio access network technologies.

[0007] Specifications for the Evolved Universal Terrestrial Radio Access Network (E-UTRAN) are ongoing within the 3rd Generation Partnership Project (3GPP). The Evolved Universal Terrestrial Radio Access Network (E-UTRAN) comprises the Long Term Evolution (LTE) and System Architecture Evolution (SAE).

[0008] An inter-radio access technology (RAT) handover is process wherein a mobile terminal switches from using a first radio access system having a first radio access technology (such as GSM) to a second radio access system having a second radio access technology (such as UTRA). Inter-RAT handover is normally initiated when the quality of a downlink radio connection of the first radio access network falls below a certain level. Inter-radio access technology (RAT) handovers are described, e.g., in United States Patent 7,181,218, entitled "COMMANDING HANDOVER BETWEEN DIFFERING RADIO ACCESS TECHNOLOGIES", which is incorporated herein by reference in its entirety.

[0009] Long Term Evolution (LTE) is a variant of a 3GPP radio access technology wherein the radio base station nodes are connected directly to a core network rather than to radio network controller (RNC) nodes. In general, in LTE the functions of a radio network controller (RNC) node are performed by the radio base stations nodes.

As such, the radio access network (RAN) of an LTE system has an essentially "flat" architecture comprising radio base station nodes without reporting to radio network controller (RNC) nodes.

[00010] The evolved UTRAN (E-UTRAN) comprises evolved base station nodes, e.g., evolved NodeBs or eNBs, providing evolved UTRA user-plane and control-plane protocol terminations toward the user equipment unit (UE). The eNB hosts the following functions (among other functions not listed): (1) functions for radio resource management (e.g., radio bearer control, radio admission control), connection mobility control, dynamic resource allocation (scheduling); (2) mobility management entity (MME) including, e.g., distribution of paging message to the eNBs; and (3) User Plane Entity (UPE), including IP Header Compression and encryption of user data streams; termination of U-plane packets for paging reasons, and switching of U-plane for support of UE mobility. The eNB hosts the PHYsical (PHY), Medium Access Control (MAC), Radio Link Control (RLC), and Packet Data Control Protocol (PDCP) layers that include the functionality of user-plane header-compression and encryption. The eNodeB also offers Radio Resource Control (RRC) functionality corresponding to the control plane. The eNodeB performs many functions including radio resource management, admission control, scheduling, enforcement of negotiated UL QoS, cell information broadcast, ciphering/deciphering of user and control plane data, and compression/decompression of DL/UL user plane packet headers.

[00011] 2G and 3G systems, including E-UTRAN, make use of Mobile Assisted handover (MAHO). Each mobile station (MS) periodically monitors the signal quality of the serving base station (BS) as well as the signal quality of base stations in its surroundings and may report the measurements back to the serving radio base station. The radio network typically initiates handovers based on these measurements. As an example, consider the case of a prepared handover (HO) in E-UTRAN. The target or candidate base station (BS), which the mobile station (MS) will be handed off to, gives guidance for the mobile station (MS) on how to make the radio access, e.g., radio resource configuration and necessary identities. Further, the serving base station (BS) needs to forward user plane data to the target base station (BS), meaning that the target base station (BS) must be known and its unique identity, so-called Cell Global Identity (CGI), must be established before executing the HO.

[00012] Typically, there is also a local identifier (ID) defined for each base station (BS). The local ID of a base station (BS) is used for layer-1 measurements and is not long enough to be unique within the network. For example, a mobile station (MS) reports the signal quality of a base station (BS) along with its local ID to the serving base station (BS). The local ID is not enough for a handover (HO), since the local ID is not unique within the network. As such, when handing off a mobile station (MS) to the neighbor the CGI of the neighbor must be known. The neighbor relation list (NRL), thus constitutes or is at least involved in the mapping from the local ID to the Cell Global Identity (CGI) and possibly also other information such as the IP address of the target base station (BS).

[00013] It is envisioned that E-UTRAN will initially have a limited radio coverage. To provide seamless mobility it is necessary to Hand Over (HO) mobile stations (MSs) in E-UTRAN to an alternative Radio Access Technology (RAT) such as GSM EDGE Radio Access Network (GERAN) or UTRAN with better coverage. It is also desired for a mobile station (MS) served by 2G (e.g. GERAN) or 3G (e.g. UTRAN), to switch to E-UTRAN once the mobile station (MS) is within the coverage of E-UTRAN. The latter is desired since higher data rates are offered by E-UTRAN, enabling services with greater bandwidth requirements. Handover between two different RATs is referred to as an inter-RAT (IRAT) handover. Further, it is projected that LTE will operate in multiple frequency bands. To handle issues like load balancing between different frequency bands, which require inter-frequency handovers (HO), IRAT and inter-frequency neighbor relation lists (NRLs) are established.

[00014] One focus area in E-UTRAN standardization work is to ensure that the new network is simple to deploy and cost efficient to operate. The vision is that the new system shall be self-optimizing and self-configuring in as many aspects as possible. *See*, e.g., 3GPP TR 32.816, Study on Management of E-UTRAN and SAE.

[00015] For inter-RAT/frequency HOs the serving base station (BS) needs to be able to trigger inter-RAT/frequency measurements, make a comparison between different RATs/frequencies, and make a HO decision. The following events typically need to be performed to prepare for HOs from a serving base station (BS) to a target base station (BS) (e.g. from a E-UTRAN BS to a UTRAN BS) as shown in Fig. 13 (the axses represent serving and candidate BS quality):

- If the estimated signal quality of the serving base station (BS) falls below a certain threshold (threshold A in Fig. 13), then inter-RAT/frequency measurements performed by the mobile station (MS) are triggered.

- If the estimated signal quality of the serving base station (BS) rises above a certain threshold (threshold A in Fig. 13), then inter-RAT/frequency measurements performed by the mobile station (MS) are stopped.

- If the estimated signal quality of the serving base station (BS) is below a certain threshold (threshold A in Fig. 13) and the estimated signal quality of the candidate base station (BS) is above a threshold (B in Fig. 13), then the inter-RAT/frequency HO procedure may be initiated.

[00016] For a mobile station (MS) with a single receiver, the receiving frequency of the mobile station (MS) has to be altered when carrying out inter-RAT/frequency measurements. When changing the frequency (during inter-RAT/frequency measurements), the mobile station (MS) is not able to communicate with the serving RAT. The state during which the mobile station (MS) carries out inter-RAT/frequency measurements is called the reading gap. The serving base station may avoid transmissions to the mobile station (MS) during the reading gap. The state during which a base station does not transmit to a mobile station (MS) is referred to as a transmission gap. Note that, in order for the mobile station (MS) to use the time of the transmission gap for inter-RAT/frequency measurements, a reading gap must be issued. From now on, it is assumed that a reading gap is always issued by the concerned mobile station (MS) when the serving base station (BS) issues a transmission gap. A reading gap can however be issued by the mobile station (MS) even if no transmission gap has been issued by the base station (BS). The gaps may occur periodically according to a predefined pattern, as shown in Fig. 14, or may be event-triggered. Further, the length of the gaps may be fixed or varying.

[00017] Some RATs, e.g., E-UTRAN and UTRAN, support dynamic scheduling of uplink (UL) and /or downlink (DL) data, where radio resources are assigned to users and radio bearers according to the users momentary traffic demand, QoS requirements, and estimated channel quality. The base station (BS) may assign radio resources in

time or frequency to mobile stations with, e.g., higher channel quality. The smallest schedulable resource entity is hereafter called a Scheduling Block (SB).

[00018] As an example, in E-UTRAN, the scheduling block (SB) comprises two consecutive resource blocks, with a total length of 1 ms and width of 180 kHz, see Fig. 15. In this case, the base station (BS) allocates SBs to mobile stations both in time and frequency. In E-UTRAN, a mobile station (MS) may be configured to report Channel Quality Indicator (CQI) reports, indicating the quality of the DL. Based on the CQI reports and QoS requirements the scheduler assigns SBs.

[00019] Previously in 2G (e.g., GERAN) and 3G (e.g., UTRAN) systems NRL lists have been populated using planning tools by means of coverage predictions before the installation of a base station (BS). Prediction errors, due to inaccuracies in topography data and wave propagation models, have forced the operators to resort to drive/walk tests to completely exhaust the coverage region and identify all handover regions and as such the neighbors. Since a radio network gradually evolves over time with new cells and changing interference circumstances, traditional planning of NRL requires iterative repetitions of the planning procedure. This has proven to be costly and new methods for automatically deriving NRLs are required. Thus, it is essential to make use of automatic in-service approaches for generating and updating NRLs.

[00020] The known existing solution aiming at automating NRL management only address one particular RAT, e.g., GERAN or UTRAN. *See,* e.g., PCT Patent Application PCT/EP2007/001737, filed February 28, 2007, which is incorporated herein by reference in its entirety. Even though NRL management has been automated for one type of RAT, the problem of establishing NRLs for different RATs/frequencies has not been solved before. Traditionally, these inter-RAT/frequency NRLs have been manually derived using topographical information and drive/walk testing. This has proven to be rather tedious and costly and new automated methods where the network itself establishes and configures the NRLs are needed.

[00021] What is needed therefore, and an object of this invention, are apparatus, methods, and techniques for establishing and managing inter-RAT measurements and information, such as that utilized by a neighbor relation list for inter-RAT/frequency mobility.

SUMMARY

[00022] The technology provides apparatus, methods, and techniques for automatically managing relationships to neighbors in other RATs/frequencies, for example neighbor relation lists (NRLs) in E-UTRAN containing GERAN and UTRAN neighbors. The technology encompasses:

- Methods & apparatus to detect new inter-RAT/frequency neighbor base stations using mobile station (MS) measurements.

- Methods and apparatus to retrieve the neighbor base station (BS) CGIs with little or no disturbance of the ongoing traffic in the serving RAT/frequency.

- Methods and apparatus for establishing new neighbors and updating the NRL.

[00023] The technology serves, e.g., advantageously to reduce operator expenses for planning and maintaining inter-RAT/frequency NRLs needed for seamless inter-RAT/frequency mobility.

[00024] In one of its aspects the technology concerns a method of operating a telecommunications system comprising a serving radio base station and a candidate radio base station. The serving radio base station comprises a radio base station to which a wireless mobile station provides measurement reports. The serving radio base station and the candidate radio base station are different with respect to at least one of frequency and radio access technology. The method comprises the serving radio base station allowing the mobile station to obtain information broadcasted by the candidate radio base station; and the mobile station obtaining the information from the candidate radio base station during at least one reading gap. The information is either information for locating Cell Global Identity (CGI) of the candidate radio base station or the Cell Global Identity (CGI) itself of the radio base station. The reading gap is a time period in which the mobile station does not receive information from the serving radio base station.

[00025] The information can take various forms. For example, depending on the context and timing, the information can be synchronization information of the candidate radio base station, local identification information of the candidate radio base station,

information for locating Cell Global Identity (CGI) of the candidate radio base station, or even the Cell Global Identity (CGI) itself.

[00026] In a first example embodiment and mode, the method further comprises the serving radio base station issuing a transmission gap to the mobile station (the transmission gap has a predetermined duration during which the mobile station is able to obtain the information from the candidate radio base station); and the mobile station obtaining the information from the candidate radio base station during the transmission gap.

[00027] In a variation of the first example embodiment and mode, the mobile station informs the serving radio base station that the mobile station will issue the at least one reading gap (with a predetermined duration during which the mobile station is able to obtain the information from the candidate radio base station); and in response thereto, the serving radio base station issues the transmission gap to the mobile station.

[00028] In a second example embodiment and mode, the method further comprises the serving radio base station starting a transmission gap and allowing the mobile station to obtain information broadcasted by the candidate radio base station; and, the serving radio base station terminating the transmission gap upon receiving the information from the mobile station.

[00029] In a variation of the second example embodiment and mode, the mobile station makes a request that the serving radio base station issue the transmission gap; and upon making the request, the mobile station starts a reading gap for obtaining the information.

[00030] In a third example embodiment and mode, the method further comprises the serving radio base station issuing periodic transmission gaps of fixed length to the mobile station (whereby, e.g., at least one of the transmission gaps is aligned with a broadcast frame of the candidate radio base station in which the information is broadcast by the candidate radio base station); and the mobile station obtaining the information during one of the period transmission gaps.

[00031] In a fourth example embodiment and mode, the method further comprises the mobile station issuing the at least one reading gap for obtaining the information from the candidate radio base station and ignoring transmissions from the serving radio base station during the reading gap. An augmentation of the fourth example embodiment and mode comprises the mobile station further recovering any frames lost during the at least one reading gap by using a repeat request procedure.

[00032] Alternatively, non-receipt of predetermined reports from the mobile station indicates that the mobile station has issued the at least one reading gap and accordingly modifying communications between the serving radio base station and the mobile station (e.g., by lowering priority of transmissions to the mobile station or by ceasing allocation of scheduling resources to the mobile station).

[00033] As a further aspect, the technology can further comprise the serving radio base station providing the information to a neighbor relation list handler.

[00034] In an illustrated, example context or environment of use, the candidate radio base station belongs to a GERAN radio access network and the serving radio base station belongs to another radio access technology (e.g., UTRAN). Conversely, in another illustrated, example context or environment of use, the candidate radio base station belongs to a UTRAN radio access network and the serving radio base station belongs to another radio access technology

[00035] In another of its aspects the technology concerns a mobile station configured for wireless operation in a telecommunications system comprising a serving radio base station and a candidate radio base station. The mobile station (MS) comprises one or more transceivers and a mobile station measurement communication function. The one or more transceivers are configured to implement wireless transmissions between the mobile station and the serving radio base station and between the mobile station and the candidate radio base station. The mobile station measurement communication function is configured to obtain information from the candidate radio base station during at least one reading gap, the information being either information for locating Cell Global Identity (CGI) of the candidate radio base station or the Cell Global Identity (CGI) itself of the radio base station. In an example implementation, the mobile station measurement communication function is configured

to obtain a first type of information from the candidate radio base station during at least one reading gap and to obtain second type of information from the candidate radio base station during at least another reading gap, each reading gap being a time period in which the mobile station does not receive information from the serving radio base station.

[00036] In another of its aspects the technology concerns a base station configured for wireless operation in a telecommunications system comprising a serving radio base station and a candidate radio base station, as well as a mobile station. The base station comprises a transceiver and a base station measurement communication function. The transceiver is configured to implement wireless transmissions between the mobile station and the serving radio base station and between the mobile station and the candidate radio base station. The base station measurement communication function is configured to allow the mobile station to obtain information from the candidate radio base station during at least one reading gap, the information being either information for locating Cell Global Identity (CGI) of the candidate radio base station or the Cell Global Identity (CGI) itself of the radio base station. In an example implementation, the base station measurement communication function is configured to allow the mobile station to obtain a first type of information from the candidate radio base station during at least one reading gap and to allow the mobile station to obtain a second type of information from the candidate radio base station during at least another reading gap, each reading gap being a time period in which the mobile station does not receive information from the serving radio base station.

[00037] Some example embodiments can use a two-stage information acquisition procedure for acquiring the ultimate necessary information (e.g., Cell Global Identity (CGI)) of the candidate base station. In the two stage information acquisition procedure, a first type of information is first acquired from the candidate base station. The first type of information is utilized to determine how to obtain a second type of information (e.g., the ultimately sought information, such as CGI) from the candidate base station. Thus, in one example embodiment and mode, the method comprises acts including the following: (a) the mobile station obtaining a first type of information from the candidate radio base station during at least one reading gap (the reading gap being a time period in which the mobile station does not receive information from the serving radio base station); (b) using the first type of information to determine how to

obtain a second type of information broadcast by the candidate radio base station; (c) the serving radio base station allowing the mobile station to obtain the second type of information broadcasted by the candidate radio base station; and, (d) the mobile station obtaining the second type of information from the candidate radio base station during at least another reading gap.

[00038] In the foregoing embodiment and method, wherein the first type of information can be one or more of synchronization information of the candidate radio base station; local identification information of the candidate radio base station; information for locating Cell Global Identity (CGI) of the candidate radio base station; and/or the Cell Global Identity (CGI) itself.

BRIEF DESCRIPTION OF THE DRAWINGS

[00039] The foregoing and other objects, features, and advantages of the invention will be apparent from the following more particular description of preferred embodiments as illustrated in the accompanying drawings in which reference characters refer to the same parts throughout the various views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the invention.

[00040] Fig. 1 is a diagrammatic view of a telecommunications system operating in conjunction with both a first radio access network having a first type radio access technology and a second radio access network having a second type radio access technology.

[00041] Fig. 2 is a diagrammatic view of a telecommunications system operating in conjunction with both a first radio access network having a first type radio access technology and a second radio access network having a second type radio access technology.

[00042] Fig. 3 is a simplified function block diagram showing certain example aspects of a representative mobile terminal and radio access network nodes which are involved in an example inter-RAT/frequency handover.

[00043] Fig. 4 is a diagrammatic view showing communications between a serving radio base station, a mobile station (MS), and a candidate radio base station

pertaining to measurements performed for detection and identification of inter-RAT/frequency neighbors, wherein the serving radio base station and the candidate radio base station belong to different RATs and/or frequencies.

[00044] Fig. 5 is a diagrammatic view illustrating that a mobile station (MS) is not able to receive from a serving radio base station during a reading gap; that quality of service (QoS) [bandwidth and/or latency) may degrade significantly for mobile stations with higher bandwidth requirement or greater number of requested scheduling blocks (e.g., mobile station B) compared to mobile stations with less bandwidth requirements (e.g., mobile station A).

[00045] Fig. 6 is a graphical view showing that a inter-RAT/frequency measurement threshold may be set higher than the corresponding handover threshold.

[00046] Fig. 7 is a diagrammatic view showing illustrating of an example embodiment and mode wherein a transmission gap is set sufficiently long (e.g., worse case scenario) to find desired information.

[00047] Fig. 8 is a diagrammatic view showing illustrating of an example embodiment and mode wherein a transmission gap occurs until desired information is obtained and reported (in Fig. 8, signaling delays between the mobile station (MS) and the serving radio base station are omitted, but would result in the transmission gap to end being later than as indicated in Fig. 8).

[00048] Fig. 9 is a diagrammatic view showing illustrating of an example embodiment and mode which uses sliding transmission gaps.

[00049] Fig. 10 is a flowchart showing example, representative acts or steps involved in an example two-stage information acquisition procedure.

[00050] Fig. 11 is a diagrammatic view showing communications between a serving radio base station, a mobile station (MS), and a candidate radio base station pertaining to measurements performed for detection and identification of inter-RAT/frequency neighbors, wherein the serving radio base station and the candidate radio base station belong to different RATs and/or frequencies; and particularly

wherein the mobile station (MS) measures frame number or scheduling information regarding the information broadcasted by the candidate BS, computes a time interval when the CGI of the candidate radio base station will be transmitted, and notifies the serving RAT when the Cell Global Identity (CGI) will be measured.

[00051] Fig. 12 is a diagrammatic view showing communications between a serving radio base station, a mobile station (MS), and a candidate radio base station pertaining to measurements performed for detection and identification of inter-RAT/frequency neighbors, wherein the serving radio base station and the candidate radio base station belong to different RATs and/or frequencies; and particularly wherein the mobile station (MS) measures the frame number of scheduling information , the serving radio base station computes a time interval when the Cell Global Identity (CGI) of the candidate radio base station will be transmitted and notifies the mobile station (MS) when the Cell Global Identity (CGI) should be measured using a particular method.

[00052] Fig. 13 is a graph reflecting signal quality as a mobile station (MS) moves away from coverage of a serving radio base station into coverage of a candidate radio base station having a different radio access technology (RAT) and/or different frequency.

[00053] Fig. 14 is a diagrammatic view showing how a mobile station (MS) may alternate between a serving radio base station and a candidate radio base station when carrying out inter-RAT/frequency measurements, and particularly showing a case in which reading gaps occur with a certain period and the gap length is constant.

[00054] Fig. 15 is a diagrammatic view illustrating scheduling in E-UTRAN wherein resources are allocated both in frequency and time to a mobile station (MS).

DETAILED DESCRIPTION

[00055] In the following description, for purposes of explanation and not limitation, specific details are set forth such as particular architectures, interfaces, techniques, etc. in order to provide a thorough understanding of the present invention. However, it will be apparent to those skilled in the art that the present invention may be practiced in other embodiments that depart from these specific details. That is, those skilled in the

art will be able to devise various arrangements which, although not explicitly described or shown herein, embody the principles of the invention and are included within its spirit and scope. In some instances, detailed descriptions of well-known devices, circuits, and methods are omitted so as not to obscure the description of the present invention with unnecessary detail. All statements herein reciting principles, aspects, and embodiments of the invention, as well as specific examples thereof, are intended to encompass both structural and functional equivalents thereof. Additionally, it is intended that such equivalents include both currently known equivalents as well as equivalents developed in the future, i.e., any elements developed that perform the same function, regardless of structure.

[00056] Thus, for example, it will be appreciated by those skilled in the art that block diagrams herein can represent conceptual views of illustrative circuitry embodying the principles of the technology. Similarly, it will be appreciated that any flow charts, state transition diagrams, pseudocode, and the like represent various processes which may be substantially represented in computer readable medium and so executed by a computer or processor, whether or not such computer or processor is explicitly shown.

[00057] The functions of the various elements including functional blocks labeled or described as "processors" or "controllers" may be provided through the use of dedicated hardware as well as hardware capable of executing software in association with appropriate software. When provided by a processor, the functions may be provided by a single dedicated processor, by a single shared processor, or by a plurality of individual processors, some of which may be shared or distributed. Moreover, explicit use of the term "processor" or "controller" should not be construed to refer exclusively to hardware capable of executing software, and may include, without limitation, digital signal processor (DSP) hardware, read only memory (ROM) for storing software, random access memory (RAM), and non-volatile storage.

[00058] 1.0 Overview

[00059] 1.1 Architectural Overview Examples

[00060] Fig. 1 shows an example telecommunications system 10 operating in conjunction with both a first radio access network 12 and a second radio access network 14. In the example telecommunications system 10 of Fig. 1, first radio access network 12 has a first type radio access technology (RAT) and second radio access network 14 has a second type radio access technology. In the non-limiting example shown in Fig. 1, it so happens that first radio access network 12 uses GERAN radio access technology, while the second radio access network 14 uses UTRAN (or E-UTRAN) radio access technology. Both first radio access network 12 and second radio access network 14 are connected to an external core network 16, such may be (for example) the Public Switched Telephone Network (PSTN) and/or the Integrated Services Digital Network (ISDN). The core network 16 can comprise, or otherwise have access to, neighbor relation list (NRL) handler 18.

[00061] Both first radio access network 12 and second radio access network 14 comprise radio base stations, generically referred to as "base stations", and optionally include a controlling node such as a base station controller (BSC) or radio network controller (RNC) for supervising one or more base stations. Whether one or both of first radio access network 12 and second radio access network 14 include a controlling node depends on specific architecture of the particular radio access network, since some radio access networks (such as E-UTRAN) have an essentially flat structure achieved by eliminating the controlling node(s) and consolidating various functions in the base station, as previously explained. In the particular example shown in Fig. 1 in which first radio access network 12 is presumed for sake of illustration to be a GERAN type radio access network and second radio access network 14 is presumed to be a UTRAN, supervising nodes are illustrated (albeit with broken lines to show their optional presence in some types of radio access networks).

[00062] The first radio access network 12 thus includes one or more base station controllers (BSCs) 26_G, with each base station controller (BSC) 26_G controlling one or more base stations (BTSs) 28_G. In the example shown in Fig. 1, base station controller (BSC) 26_G is connected to two base stations, particularly base station (BTS) $28Q_{-1}$ and base station (BTS) 28_{G-2}. Each base station (BTS) 28_G is depicted in Fig. 1 as serving three cells C. Each cell C is represented by a circle proximate the respective base station. Thus, it will be appreciated by those skilled in the art that a base station may serve for communicating across the air interface for more than one cell, and that

differing base stations may serve differing numbers of cells. The base station controllers (BSCs) 26_G controls radio resources and radio connectivity within a set of cells, e.g., the cells C_G shown in Fig. 1. Each base station (BTS) 28_Q handles the radio transmission and reception within one or more cells.

[00063] The second radio access network 14 includes one or more radio network controllers (RNCs) 26u- For sake of simplicity, the UTRAN 14 of Fig. 1 is shown with only one RNC node, although typically more than one such node is typically provided. The RNC node 26u is connected to a plurality of base stations (BS) 28u- For example, and again for sake of simplicity, two base station nodes ~ base station (BS) 28_{U-1} and base station (BS) 28u-$_2$ ~ are shown connected to RNC 26u. It will again be appreciated that a different number of base stations can be served by an RNC, and that RNCs need not serve the same number of base stations. As in GERAN network 12, in UTRAN network 14 for sake of simplicity each base station 28u is shown as serving three cells (each such cell being labeled at least partially as Cy). In second radio access network (UTRAN network) 14, the radio network controller (RNC) 26u controls radio resources and radio connectivity within a set of cells Cu, while the base stations (BS) 28u handle the radio transmission and reception within one or more cells.

[00064] A wireless mobile station (MS) 30 is shown in Fig. 1. As used herein, the term "mobile station (MS)" generically encompasses both the notion of a mobile station and the notion of a user equipment unit (UE), as well as other concepts as previously explained. As explained herein, one of the base stations of one of the radio access networks (either first radio access network 12 or second radio access network 14) serves as a serving base station for mobile station (MS) 30 and another of the base stations of the other of the radio access networks may be a candidate base station for mobile station (MS) 30. Thus, for example, cell CQ-$_2$-$_3$ of first radio access network 12 may be the serving base station for mobile station (MS) 30, but in view of proximity and/or reception cell Cu-i-i may be a candidate base station. The converse could also occur.

[00065] Fig. 2 shows another example telecommunications system 10' operating in conjunction with both first radio access network 12' and second radio access network 14'. In the example telecommunications system 10 of Fig. 1, first radio access network 12' operates at a first radio frequency (fl) while the second radio access network 14'

operates at a second frequency (£2). As in the Fig. 1 example, both first radio access network 12' and second radio access network 14' are connected to an external core network 16 which can comprise, or otherwise have access to, neighbor relation list (NRL) handler 18.

[00066] The first radio access network 12' optionally comprises one or more base station controllers (BSCs) 26_{1f}, with each base station controller (BSC) 26_{1f} (when deployed) controlling one or more base stations (BTSs) 28_{1f}, the base stations (BTS) 28_{if} serving cells C_{1f} in much the same manner as in Fig. 1. Likewise, the second radio access network 14' optionally includes one or more radio network controllers (RNCs) 26_{2f}, with each RNC node 26_{2f} (when deployed) connected to one or more base stations (BS) 28_{2f} serving cells C_{2f}.

[00067] It should be appreciated that the technology described herein pertains to one or both of the inter-RAT type of operation depicted in Fig. 1 (comprising radio access networks of different radio technology access types) and the inter-frequency type of operation depicted in Fig. 2 (comprising radio access networks of different radio frequencies). For this reason the inclusive nomenclature inter-RAT/frequency is employed. The entire subsequent discussion including reference to ensuing figures encompasses both types of operation, e.g., both inter-RAT and inter-frequency, unless specifically stated otherwise or clear from the context.

[00068] In view of the applicability of the technology both to inter-RAT operation and inter-frequency operation, Fig. 3 generically shows serving base station 28_S and candidate base station 28_C. The serving base station 28_S can belong to one type of radio access technology, while candidate base station 28_C can belong to another type of radio access technology. In such example, it does not make any difference for the purpose of Fig. 3 as to what types of differing radio access technologies are employed in the radio access networks of serving base station 28_S and candidate base station 28_C. Alternatively, serving base station 28_S can belong to a radio access network (or base station) which operates at a first frequency, while candidate base station 28_C can belong to a radio access network (or base station) which operates at a first frequency. Further, Fig. 3 shows serving base station 28_S and candidate base station 28_C as (optionally) being connected to controlling nodes such as a BSC/RNC type node, and particularly to nodes 26_S and 26_C, respectively.. Fig. 3 shows selected general aspects of mobile

station (MS) 30 and selected functionalities of the serving base station 28s and candidate base station 28_C.

[00069] The mobile station (MS) 30 shown in Fig. 3 includes a data processing and control unit 31 for controlling various operations required by mobile station (MS) 30. The data processing and control unit 31 of mobile station (MS) 30 includes mobile terminal inter-RAT/frequency handover function 40 and measurement communication function 42, the purposes of which are described in more detail subsequently. In addition, the data processing and control unit 31 provides control signals as well as data to radio transceiver 33 connected to antenna 35. The measurement communication function 42 controls communications with serving base station 28_S and candidate base station 28c when requesting or obtaining measurements or information (e.g., measurements or information for potential handover purposes) are concerned. The inter-RAT/frequency handover function 40 actually is invoked when it is determined that a handover is to occur.

[00070] By way of example and non-exhaustive description, both serving base station 28_S and candidate base station 28_C as shown in Fig. 3 comprise base station data processing and control unit 36, which is connected to one or more base station transceivers (TX/RX) 38. Each base station transceiver (TX/RX) 38 is connected to a corresponding antenna 39, an appropriate one of which communicates over an air interface with mobile station (MS) 30.

[00071] The data processing and control unit 36 of each of serving base station 28_S and candidate base station 28_C comprise inter-RAT/frequency handover function 50 and measurement communication function 52. For example, serving base station 28_S comprises inter-RAT/frequency handover function 50_s and measurement communication function 52_S, while candidate base station 28_C comprises inter-RAT/frequency handover function 50_c and measurement communication function 52_C, For each base station, the respective measurement communication function 52 controls communications with mobile station (MS) 30 for requesting or obtaining measurements or information (e.g., measurements or information for potential handover purposes); the respective inter-RAT/frequency handover function 50 is invoked when it is determined that a handover is to occur.

[00072] Any or all of mobile terminal inter-RAT handover function 40; measurement communication function 42; inter-RAT/frequency handover function 50; and/or measurement communication function 52 can comprise a controller or processor as those terms are expansively described herein. Although not specifically referenced at very juncture of discussion, these functions are involved in performing acts described herein and as summarized briefly above.

[00073] 1.2 Example Operation Overview

[00074] Fig. 4 illustrates certain basic example, non-limiting acts or steps which comprise an inter-RAT/frequency measurement scenario. Inter-RAT/frequency measurements from certain mobile stations chosen using the triggering condition(s) described in Section 2.0 are used to detect new inter-RAT/frequency neighbors, as illustrated in Fig. 4, act (1). The actual triggering condition(s) comprising, e.g., rules and thresholds, may be evaluated at the base station (BS) or the mobile station (MS). In the former case, the base station (BS) receives measurements from the mobile station (MS) and evaluates the triggering conditions. In the latter case, the base station (BS) informs the mobile station (MS) regarding the triggering conditions and the mobile station (MS) evaluates the conditions and starts inter-RAT/frequency measurements once they are triggered. In the measurement configuration sent from the base station (BS) to the mobile station (MS) (Fig. 4, act (I)), the base station (BS) may include information needed to perform the measurement [for example the Absolute Radio Frequency Channel Numbers (ARFCNs) for GERAN BSs and ARFCNs and scrambling codes for UTRAN BSs].

[00075] The mobile station (MS) measures the signal quality of surrounding inter-RAT/frequency base stations once the condition(s) in Section 2.0 are triggered. As shown by act (2a) of Fig. 4, the measurements are performed during reading gaps (explained above) and (as shown by act (2b) of Fig. 4) each measurement result is reported to the serving base station (BS) together with the local ID of the base station (BS). The local ID can take the form, for example, of the Base Station Identity Code (BSIC) for GERAN or the scrambling code for UTRAN.

[00076] If the serving base station (BS) has no prior knowledge of a neighbor base station (BS) with the reported local ID, the serving base station (BS) may send a CGI

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measurement request to the mobile station (MS), as illustrated by act (3) in Fig. 4. As illustrated by act (4b) of Fig. 4, the mobile station (MS) measures the Cell Global Identity (CGI) of the candidate base station (BS), using, e.g., one of the embodiments and modes presented in Section 3.0, and (as illustrated by act (4a)) reports the Cell Global Identity (CGI) to the serving base station (BS). In an example embodiment, the mobile station measurement communication function 42 can be configured to receive and send communications which comprise the acts of Fig. 4, including the acts of measuring the Cell Global Identity (CGI) of the candidate base station (BS) as in act (4b) of Fig. 4 and reporting the Cell Global Identity (CGI) to the serving base station (BS) as in act (4a) of Fig. 4. In an example embodiment, the base station measurement communication function 52 can be configured to receive and send communications such as those shown in Fig. 4 and which enable or allow the mobile station to perform acts of Fig. 4.

[00077] Based on the inter-RAT/frequency measurement reports and the information retrieved from the lookup, the candidate base station (BS) can be added to the neighbor relation list (NRL) of the serving base station (BS). As illustrated by optional act (5) of Fig. 4, the serving base station (BS) can inform an NRL handler, such as an Operation and Support System (OSS) or any other management node, about the newly detected candidate base station (BS). As illustrated by optional act (6) of Fig. 4, the NRL handler informs the candidate base station (BS) regarding the new neighbor relation. Upon being so informed, the candidate base station (BS) adds an entry corresponding to the serving base station (BS) in its NRL.

[00078] 2.0 Inter-RAT/frequency Measurement Triggering

[00079] Different triggering criteria for inter-RAT/frequency measurements are possible. Suggested criteria include but are not limited to the following:

a) Mobile stations with low data rates perform inter-RAT/frequency measurements. Retransmissions due to poor channel quality may result in a greater actual transmitted data than required by the services in the mobile station (MS). Therefore, the criterion for choosing mobile stations for measurements must be based on the actual transmitted UL and DL data rates to the mobile station (MS).

b) Mobile stations with an estimated signal quality of the serving base station (BS) below a given threshold (see threshold C in Fig. 6) perform inter-RAT/frequency measurements.

[00080] Considering criteria 0 described above, recall from the discussion concerning, e.g., Fig. 15, that a scheduling block (SB) is the smallest schedulable entity and that the base station (BS) may control the UL and DL transmissions including retransmissions for a particular mobile station (MS). The impact on a service, e.g., video streaming, when performing inter-RAT/frequency measurements is smaller for mobile stations that require less number of scheduling blocks (SBs), as shown in Fig. 5. As such, mobile stations with a low average number of scheduled scheduling blocks (SBs) should perform inter-RAT/frequency measurements.

[00081] The threshold used in criteria b) can either be the same threshold as is used for inter-RAT/frequency handover measurements (e.g., threshold A in Fig. 6), or it can be set higher than the handover threshold (e.g., higher than threshold A of Fig. 6 , such as threshold C in Fig. 6)) to make sure that an inter-RAT/frequency neighbor is found before the mobile station (MS) falls out of coverage.

[00082] The usage of the triggering criterion a) and b), and the setting of the threshold used in criteria b) can vary with different situations. For example a newly deployed base station (BS) may have many unknown neighbors and in order to find them quickly both alternatives a) and b) could be used. In a newly deployed base station (BS) it may also be suitable to set the inter-RAT/frequency threshold (C in Fig. 6) higher than the handover (HO) measurement threshold. For a base station (BS) that has been in the network for some time, most of the neighbors can be assumed to be found already and it may be enough to use only criteria b) with the same threshold as for handover measurements .

[00083] Furthermore, the threshold C can depend on the service, subscription type, UE type etc. For example, Gold subscription users are assigned lower threshold C than ordinary subscription users to avoid bulk measurements to a larger extent.

[00084] 3.0 Cell Global Identity (CGI) Measurements

[00085] Assume that the mobile station (MS) has reported a candidate base station (BS) in another RAT/frequency and that the serving base station (BS) requests a CGI measurement (act 3 in Fig. 4). To measure the Cell Global Identity (CGI) of a base station (BS) in another RAT/frequency, the mobile station (MS) has again to tune in to the frequency of the base station (BS) and stop listening to the serving RAT/frequency for the time needed to measure the desired information of the candidate RAT/frequency. To obtain the Cell Global Identity (CGI) of a candidate base station (BS) it may be needed to first obtain synchronization, then the actual time when the CGI is transmitted needs to be obtained, and finally the CGI can be measured. This technology suggests a number of different ways, e.g., different embodiments and modes, to handle the measurements of information transmitted from a base station (BS) in a different RAT/frequency. As used herein, "measurements" can refer to any and all entities or types of information, e.g., synchronization and local ID, that must be known in order to obtain the Cell Global Identity (CGI). Consequently, the embodiments and modes may be used to measure any information transmitted by a base station (BS) in a different RAT/frequency, not only the Cell Global Identity (CGI).

[00086] 3.1 First Embodiment/Mode (Method a)

[00087] In a first example embodiment and mode, also known as "method a" or "solution a" and illustrated in Fig. 7, the serving base station (BS) issues a transmission gap of length T, where T is the worst case time to obtain the desired information from the candidate base station (BS). During this gap the mobile station (MS) measures the desired information. Note, this solution requires that the serving base station (BS) be aware of the worst case time T.

[00088] As a variation of the first example embodiment and mode, also known as "method d" or "solution d", the mobile station (MS) informs the base station (BS) that it will measure during a reading gap of length T. The serving base station (BS) creates a transmission gap during this period. This method is a subset of method a), however, in this case the mobile station (MS) initiates the transmission gap.

[00089] 3.2 Second Embodiment/Mode (Method b)

[00090] In a second example embodiment and mode, also known as "method b" or "solution b" and illustrated in Fig. 8, the serving base station (BS) starts a transmission gap right after transmitting the measurement request to the mobile station (MS). During this gap, the mobile station (MS) measures the desired information. The transmission gap ends as soon as the serving base station (BS) receives the measurement result from the mobile station (MS). The gap will have the maximum length T, where T is the worst case time to obtain the desired information. In contrast to solution a), the length of T must not be known in advance.

[00091] As a variation of the second example embodiment and mode, also known as "method e" or "solution e", the mobile station (MS) starts a reading gap right after sending a transmission gap message to the serving base station (BS). The base station (BS) issues a transmission gap that ends as soon as the base station (BS) receives the measurement result from the mobile station (MS). This method is analogous to method b), however, in this case the mobile station (MS) initiates the transmission gap

[00092] 3.3 Third Embodiment/Mode (Method c)

[00093] In a third example embodiment and mode, also known as "method c" or "solution c" and illustrated in Fig. 9, the serving base station (BS) issues periodic transmission gaps of fixed length where the mobile station (MS) measures the desired information. Assume that the desired information is transmitted periodically. Under certain conditions the transmission gaps will slide relatively to the broadcast frames for the desired information and eventually align with one of these broadcast frames.

[00094] 3.4 Fourth Embodiment/Mode (Method f)

[00095] In a fourth example embodiment and mode, also known as "method f" or "solution f", The mobile station (MS) issues a reading gap and ignores transmissions from the serving RAT/frequency during this time in order to perform inter-RAT/frequency measurements, without reporting this to the serving base station (BS). During inter-RAT/frequency measurements the mobile station (MS) is not reachable.

The network will experience the same behavior as if the mobile station (MS) was passing through a shadow region.

[00096] A serving base station (BS) can ensure that no SBs (DL and UL transmissions) are allocated for a mobile station (MS) when it is performing inter-RAT/frequency measurements. The methods a)-e) ensure that no DL and UL transmissions occur during the time interval when the mobile station (MS) is measuring another RAT/frequency and, therefore, is not able to communicate with the serving RAT/frequency. Methods a)-c) are initiated by the serving base station (BS), which is aware of the time interval during which the mobile station (MS) is performing inter-RAT/frequency measurements. Methods d) and e) are initiated by the mobile station (MS), which informs the serving base station (BS) that it will carry out inter-RAT/frequency measurements.

[00097] Method f) may result in loss of radio frames, since the mobile station (MS) abruptly changes frequency in order to perform inter-RAT/frequency measurements. However, this is not expected to be significant problem since any loss of frames is recovered using Hybrid Automatic Repeat Request (HARQ). Further, a mobile station (MS) may be configured to send CQI reports to the base station (BS). A mobile station (MS) that is performing inter-RAT/frequency measurements may not be able to send pre-determined reports (e.g., CQI reports and (N)ACKs) to the serving RAN. Further, the base station (BS) knows that the mobile station (MS) at some unknown time will stop listening to the serving base station (BS) in order to perform the inter-RAT/frequency measurements. Therefore, the lack of incoming pre¬determined reports (e.g., CQI reports) form a certain mobile station (MS) and/or the knowledge that a measurement request has been sent to the same mobile station (MS) (which has not yet reported the measurements results) can be used as an indication that the mobile station (MS) is currently performing inter-RAT/frequency measurements. As such, the scheduler may be configured such that it lowers the priority of transmissions to that mobile station (MS) or does not allocate any scheduling blocks (SBs) to that mobile station (MS). The consequence of this is that the drop probability of radio frames to a mobile station (MS) performing inter-RAT/frequency measurements is lowered and that the scheduler can allocate SBs to other mobile station (MS).

[00098] 4.0 Measurement Enhancements/Variations

[00099] Some example embodiments can use a two-stage information acquisition procedure for acquiring the ultimate necessary information (e.g., Cell Global Identity (CGI)) of the candidate base station. In the two stage information acquisition procedure, a first type of information is first acquired from the candidate base station. The first type of information is utilized to determine how to obtain a second type of information (e.g., the ultimately sought information, such as CGI) from the candidate base station.

[000100] Fig. 10 shows example, representative acts or steps involved in an example two-stage information acquisition procedure. Act 10-1 comprises the mobile station obtaining a first type of information from the candidate radio base station during at least one reading gap. The first type of information can be any information which will facilitate determining how to obtain the second type of information. For example, the first type of information can be frame number or scheduling information broadcast from the candidate base station. The reading gap for act 10-1 is a time period in which the mobile station does not receive information from the serving radio base station. In an example implementation of the Fig. 10 procedure, the serving radio base station allows the mobile station to obtain the first type of information broadcasted by the candidate radio base station.

[000101] Act 10-2 of the example two-stage information acquisition procedure of Fig. 10 comprises using the first type of information to determine how to obtain a second type of information broadcast by the candidate radio base station. The determination can be made either by the mobile station (MS) (as in the example implementation described with respect to Fig. 11 below) or by the serving base station (as in the example implementation described with respect to Fig. 12 below).

[000102] Act 10-3 of the example two-stage information acquisition procedure of Fig. 10 comprises the serving radio base station allowing the mobile station to obtain the second type of information broadcasted by the candidate radio base station. As used herein, the serving base station "allowing" the mobile station to obtain the second type of information can include the serving base station to permit or authorize the mobile station to obtain the second type of information, but in at least one embodiment

the mobile station, although permitted or authorized, may ignore transmissions from the serving base station in order to obtain information from the candidate base station. Act 10-4 comprises the mobile station obtaining the second type of information (e.g., the Cell Global Identity (CGI)) from the candidate radio base station during at least another reading gap.

[000103] One or a combination of the methods, presented in Section 3.0, can be used to measure desired information from base stations in other RATs/frequencies. Moreover, the first type of information (acquired in act 10-1 of Fig. 10, for example) can be acquired using one of the methods of Section 3.0, and the second type of information (acquired in act 10-4 of Fig. 10, for example) can be acquired using another (e.g., different) ones of the methods of Section 3.0. In other words, it is not necessary that the same method be used to acquire the first type of information (which is used to help locate the second type of information) and the second type of information.

[000104] Inter-RAT/frequency measurements could give less disturbances of the carried traffic to the serving base station (BS) if synchronization information and possibly other measured information from the candidate base station (BS) are used to find the time interval when the desired information, e.g., Cell Global Identity (CGI), is transmitted. With this information, for example method a) or b) as described in Section 3.1 and Section 3.2 can be utilized during this given time only, which leads to less or no disturbance of the ongoing traffic in the serving RAT/frequency. If the candidate base station (BS) synchronization is not already known it can be found by using one of methods a) - f), as described in Section 3.0.

[000105] Act 10-2 of Fig. 10 involves using the first type of information to determine how to obtain the second type of information broadcast by the candidate radio base station. Determining how to obtain the second type of information can include calculating the transmission time interval for the desired information based on measurement results (the first type of information), such as current frame number and possibly scheduling information, can be done either by the mobile station (MS) or by the serving base station (BS) provided that the needed information has been reported by the mobile station (MS).

[000106] Fig. 11 illustrates an example scenario in which the mobile station (MS) informs its serving base station (BS) of the time interval when a method for inter-RAT/frequency measurements is used. For example, act 1 in Fig. 11 shows the mobile station (MS) acquiring the frame number or scheduling information from the candidate base station. Act 2 of Fig. 11 represents the mobile station (MS) advising the serving base station that the mobile station (MS) is using a particular method (represented generically as method "X" in Fig. 11) to measure the CGI during a certain time interval (represented by time interval "[a,b]" in Fig. 11). Act 3 of Fig. 11 shows the mobile station (MS) actually measuring or acquiring the CGI of the candidate base station during the time interval that was announced in act 2 of Fig. 11. Act 4 of Fig. 11 depicts the mobile station (MS) informing the serving base station of the CGI which was acquired as a result of act 3 of Fig. 11.

[000107] Fig. 12 illustrates another example scenario, and particularly a scenario in which the serving base station (BS) instructs the mobile station (MS) of the time interval when a method for inter-RAT/frequency measurements should be used. Act 1 of Fig. 12 shows the mobile station (MS) acquiring the frame number or scheduling information from the candidate base station. Act 2 of Fig. 11 represents the mobile station (MS) advising the serving base station of information of the candidate base station, such as the frame number, scheduling information, time alignment, etc. Act 3 of Fig. 12 depicts the serving base station directing the mobile station (MS) to use a particular method (represented generically as method "X" in Fig. 12) to measure the CGI during a certain specified time interval (represented by time interval "[a,b]" in Fig. 12). Act 4 of Fig. 12 shows the mobile station (MS) actually measuring or acquiring the CGI of the candidate base station during the time interval that was prescribed in act 3 of Fig. 12. Act 5 of Fig. 12 shows the mobile station (MS) informing the serving base station of the CGI which was acquired as a result of act 4 of Fig. 12.

[000108] As a further alternative, the mobile station (MS) may decide not to inform the base station (BS) regarding the time interval and simply start measuring the desired information as proposed in method of Section 3.4.

[000109] 5.0 Example Implementations

[000110] 5.1 First Example

[000111] A first example implementation for measuring the Cell Global Identity (CGI) of a base station (BS) in another RAT/frequency is now described. Assume that the triggering condition(s) outlined in Section 2.0 has been satisfied and the mobile station (MS) is to start inter-RAT/frequency measurements. Then the mobile station (MS) may need to synchronize and measure the signal quality of a candidate base station (BS). This is done in the currently described example implementation using method c) in Section 3.3 with sliding transmission gaps. The serving base station (BS) may request the mobile station (MS) to measure the Cell Global Identity (CGI) of the candidate base station (BS), i.e., act 3 in Fig. 4. If the mobile station (MS) is at this state not aware of when the Cell Global Identity (CGI) of the candidate base station (BS) will be transmitted, it attains the scheduling information using method f) in Section 3.4. The scheduling information may be based on the frame number (as in e.g., GERAN) or any other explicit scheduling information broadcasted by the candidate base station (BS) (e.g., UTRAN). The mobile station (MS) then computes the time interval during which the CGI of the candidate base station (BS) is transmitted and measures the CGI using method f), meaning that the mobile station (MS) ignores transmissions from the serving RAT/frequency during the measurement time.

[000112] 5.2 Second Example

[000113] The second example pertains to retrieving CGI from a GERAN BS while connected to another RAT/frequency. In GERAN the CGI is transmitted on the BCH. The TDMA frame number where the CGI will be transmitted is specified in 3GPP TS 45.002, Multiplexing and multiple access on the radio path. By using for example method c) (in Section 3.0) with sliding transmission gaps the FCCH for frequency fine-tuning and the SCH for synchronization can be measured. When the SCH has been read, the mobile station (MS) will know the current frame number. If the mobile has kept the synchronization to the GERAN base station (BS) since the local ID was measured, the current frame number is already known, and the mobile will not need to perform additional measurements of FCCH and SCH.

[000114] Once the current frame number is known, the mobile station (MS) is able to calculate the time interval to measure the CGI. This measurement is performed using for example method f) (in Section 3.4), i.e. the mobile station (MS) measures the CGI of the GERAN base station (BS) and ignores transmissions from the serving

RAT/frequency during the measurement time. The mobile station (MS) then reports the measured CGI to the base station (BS).

[000115] 5.3 Third Example

[000116] The third example pertains to retrieving CGI from an UTRAN base station (BS) while connected to another RAT/frequency. In UTRA the CGI is transmitted on the Primary Common Control Physical Channel (P-CCPCH) 3GPP TS 25.331, Radio Resource Control (RRC); Protocol specification. The radio frame in which the CGI is transmitted is given by the Master Information Block (MIB), which is also transmitted in the P-CCPCH. The mobile station (MS) must therefore first read the information contained in the MIB and then read the CGI.

[000117] The mobile station (MS) synchronizes and obtains the scrambling code of the candidate base station (BS) by using for example method c) (in Section 3.3) with sliding transmission gaps. When synchronized, the mobile station (MS) starts reading the P-CCPCH and obtains the System Frame Number (SFN). The mobile station (MS) calculates the frame and the time interval in which the MIB is transmitted using the SFN. The mobile station (MS) reads the contents of the MIB, using for example method f) (in Section 3.4), and obtains the frame and the time interval in which CGI is transmitted. The mobile station (MS) then reads the CGI using for example method f) (in Section 3.4) and reports the CGI to the serving base station (BS).

[000118] 6.0 Example Advantages

[000119] Automatic inter-RAT/frequency NRL management as described herein leads to lower costs for the operators in planning and maintaining neighbor relation lists (NRLs), which are needed for seamless inter-RAT/frequency mobility. The advantages offered by this technology include (without limitation):

- Very little or no human intervention is required when establishing neighbor relation lists (NRLs).

- The methods presented are based on feedback information from the mobile stations and, as such, the automatic NRL (ANRL) management is responsive to changes in radio propagation conditions in the cell.

- Radio propagation models based on, e.g., topology, are not needed, since the invention relies on the feedback information from mobile stations.

- Very small or negligible disturbances are introduced in the carried traffic between the mobile stations and the base stations.

- A negligible traffic is introduced in the transport network between the base stations compared to previous art, some of which rely on the base stations to continuously exchange information regarding the mobile stations in their respective service areas.

- Inter-RAT/frequency NRL is supported in contrast to previous known solutions that only address one particular RAT.

[000120] Although the description above contains many specificities, these should not be construed as limiting the scope of the invention but as merely providing illustrations of some of the presently preferred embodiments. Therefore, it will be appreciated that the scope of the present invention fully encompasses other embodiments which may become obvious to those skilled in the art, and that the scope of the present invention is accordingly not to be limited. Reference to an element in the singular is not intended to mean "one and only one" unless explicitly so stated, but rather "one or more." AU structural and functional equivalents to the elements of the above-described preferred embodiment that are known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed hereby. Moreover, it is not necessary for a device or method to address each and every problem sought to be solved by the present invention, for it to be encompassed hereby.

WHAT IS CLAIMED IS:

1. A method of operating a telecommunications system (10) comprising a serving radio base station (50_s) and a candidate radio base station (50_c), the serving radio base station (50s) being a radio base station to which a wireless mobile station (30) provides measurement reports, the serving radio base station (50_s) and the candidate radio base station (50_c) being different with respect to at least one of frequency and radio access technology, the characterized by:

the serving radio base station (50s) allowing the mobile station (30) to obtain information broadcasted by the candidate radio base station candidate radio base station (50c); and

the mobile station (30) obtaining the information from the candidate radio base station (50_c) during at least one reading gap, the information being either information for locating Cell Global Identity (CGI) of the candidate radio base station (50_c) or the Cell Global Identity (CGI) itself of the radio base station, the reading gap being a time period in which the mobile station (30) does not receive information from the serving radio base station (50_s).

2. The method of claim 1, wherein the information is synchronization information of the candidate radio base station (50c).

3. The method of claim 1, wherein the mformation is local identification information of the candidate radio base station (50_c).

4. The method of claim 1, further comprising:

the serving radio base station (50_s) issuing a transmission gap to the mobile station (30), the transmission gap having a predetermined duration during which the mobile station (30) is able to obtain the information from the candidate radio base station (50_c), and

the mobile station (30) obtaining the information from the candidate radio base station (50_c) during the transmission gap.

5. The method of claim 4, further comprising:
the mobile station (30) informing the serving radio base station (50s) that the mobile station (30) will issue the at least one reading gap; and in response thereto,
the serving radio base station (50_s) issuing the transmission gap to the mobile station (30).

6. The method of claim 1, further comprising:
the serving radio base station (50_s) starting a transmission gap and allowing the mobile station (30) to obtain information broadcasted by the candidate radio base station (50_c);
the serving radio base station (50_s) terminating the transmission gap upon receiving the information from the mobile station (30).

7. The method of claim 6, further comprising:
the mobile station (30) making a request that the serving radio base station (50_s) issue the transmission gap; and upon making the request,
the mobile station (30) starting a reading gap for obtaining the information.

8. The method of claim 1, further comprising:
the serving radio base station (50_s) issuing periodic transmission gaps of fixed length to the mobile station (30) whereby at least one of the transmission gaps is aligned with a broadcast frame of the candidate radio base station (50_c) in which the information is broadcast by the candidate radio base station (50_c);
the mobile station (30) obtaining the information during one of the period transmission gaps.

9. The method of claim 1, further comprising the mobile station (30) issuing the at least one reading gap for obtaining the information from the candidate radio base station (50_c) and ignoring transmissions from the serving radio base station (50_s) during the reading gap.

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10. The method of claim 9, further comprising the mobile station (30) recovering any frames lost during the at least one reading gap by using a repeat request procedure.

11. The method of claim 1, further comprising the serving radio base station (50s) realizing that non-receipt of predetermined reports from the mobile station (30) indicates that the mobile station (30) has issued the at least one reading gap and the serving radio base station (50_s) accordingly modifying communications between the serving radio base station (50_s) and the mobile station (30).

12. The method of claim 11, further comprising the serving radio base station (50_s) modifying communications between the serving radio base station (50_s) and the mobile station (30) by lowering priority of transmissions to the mobile station (30).

13. The method of claim 11, further comprising the serving radio base station (50_s) ceasing allocation of scheduling resources to the mobile station (30).

14. The method of claim 1, further comprising the serving radio base station (50s) providing the information to a neighbor relation list handler.

15. The method of claim 1, wherein the candidate radio base station (50_c) belongs to a GERAN radio access network and the serving radio base station (50_s) belongs to another radio access technology.

16. The method of claim 1, wherein the candidate radio base station (50_c) belongs to a UTRAN radio access network and the serving radio base station (50_s) belongs to another radio access technology.

17. The method of claim 1, further comprising:

(a) the mobile station (30) obtaining a first type of information from the candidate radio base station (50c) during at least one reading gap;

(b) using the first type of information to determine how to obtain a second type of information broadcast by the candidate radio base station (50_c);

(c) the mobile station (30) obtaining the second type of information from the candidate radio base station (50_c) during at least another reading gap.

18. The method of claim 17, further comprising the serving radio base station (50_s) allowing the mobile station (30) to perform act (a) to obtain the first type of information broadcasted by the candidate radio base station (50_c) and to obtain the second type of information broadcasted by the candidate radio base station (50_c).

19. The method of claim 17, wherein the first type of information is one or more of synchronization information of the candidate radio base station (50c) and local identification information of the candidate radio base station (50_c).

20. The method of claim 17, wherein the first type of information is information for locating Cell Global Identity (CGI) of the candidate radio base station (50c).

21. The method of claim 17, wherein the second type of information is Cell Global Identity (CGI) of the candidate radio base station (50_c).

22. The method of claim 17, wherein:

act (a) is performed using acts of one of claims 6 through and including claim 11; and

act (d) is performed using acts of another of claims 6 through and including claim 11.

23. A mobile station (30) configured for wireless operation in a telecommunications system (10) comprising a serving radio base station (50_s) and a candidate radio base station (50_c), the mobile station (30) comprising:

one or more transceivers (33) configured to implement wireless transmissions between the mobile station (30) and the serving radio base station (50_s) and between the mobile station (30) and the candidate radio base station (50_c);

characterized by:

a mobile station measurement communication function (42) configured to obtain information from the candidate radio base station (50_c) during at least one reading gap, the information being either information for locating Cell Global Identity (CGI) of the candidate radio base station (50_c) or the Cell Global Identity (CGI) itself of the radio base station, the reading gap being a time period in which the mobile station (30) does not receive information from the serving radio base station (50_s).

24. The apparatus of claim 23, wherein the information is synchronization information of the candidate radio base station (50c).

25. The apparatus of claim 23, wherein the information is local identification information of the candidate radio base station (50_c).

26. The apparatus of claim 23, wherein the mobile station measurement communication function (42) is configured to obtain a first type of information from the candidate radio base station (50_c) during at least one reading gap and to obtain second type of information from the candidate radio base station (50_c) during at least another reading gap, each reading gap being a time period in which the mobile station (30) does not receive information from the serving radio base station (50_s).

27. The apparatus of claim 26, wherein the first type of information is information for locating Cell Global Identity (CGI) of the candidate radio base station (50c).

28. The apparatus of claim 26, wherein the second type of information is Cell Global Identity (CGI) of the candidate radio base station (50_c).

29. A. base station (50) of a telecommunications system (10) which serves as a serving base station and is configured for wireless transmission to a mobile station (30), the base station (50) comprising:

a transceiver (38) configured to implement wireless transmissions between the mobile station (30) and the base station and between the mobile station (30);

characterized by:

a base station measurement communication function (52) configured to allow the mobile station (30) to obtain information from a candidate radio base station (50_c) during at least one reading gap, the information being either information for locating Cell Global Identity (CGI) of the candidate radio base station (50_c) or the Cell Global Identity (CGI) itself of the radio base station, the reading gap being a time period in which the mobile station (30) does not receive information from the serving radio base station ($5O_8$).

30. The apparatus of claim 29, wherein the base station communication function (52) is configured to allow the mobile station (30) to obtain a first type of infoπnation from the candidate radio base station (50_c) during at least one reading gap and to allow the mobile station (30) to obtain a second type of information from the candidate radio base station (50_c) during at least another reading gap, each reading gap being a time period in which the mobile station (30) does not receive information from the serving radio base station (50_s).

31. The apparatus of claim 30, wherein the first type of information is information for locating Cell Global Identity (CGI) of the candidate radio base station (50c).

32. The apparatus of claim 30, wherein the second type of information is Cell Global Identity (CGI) of the candidate radio base station (50_c).

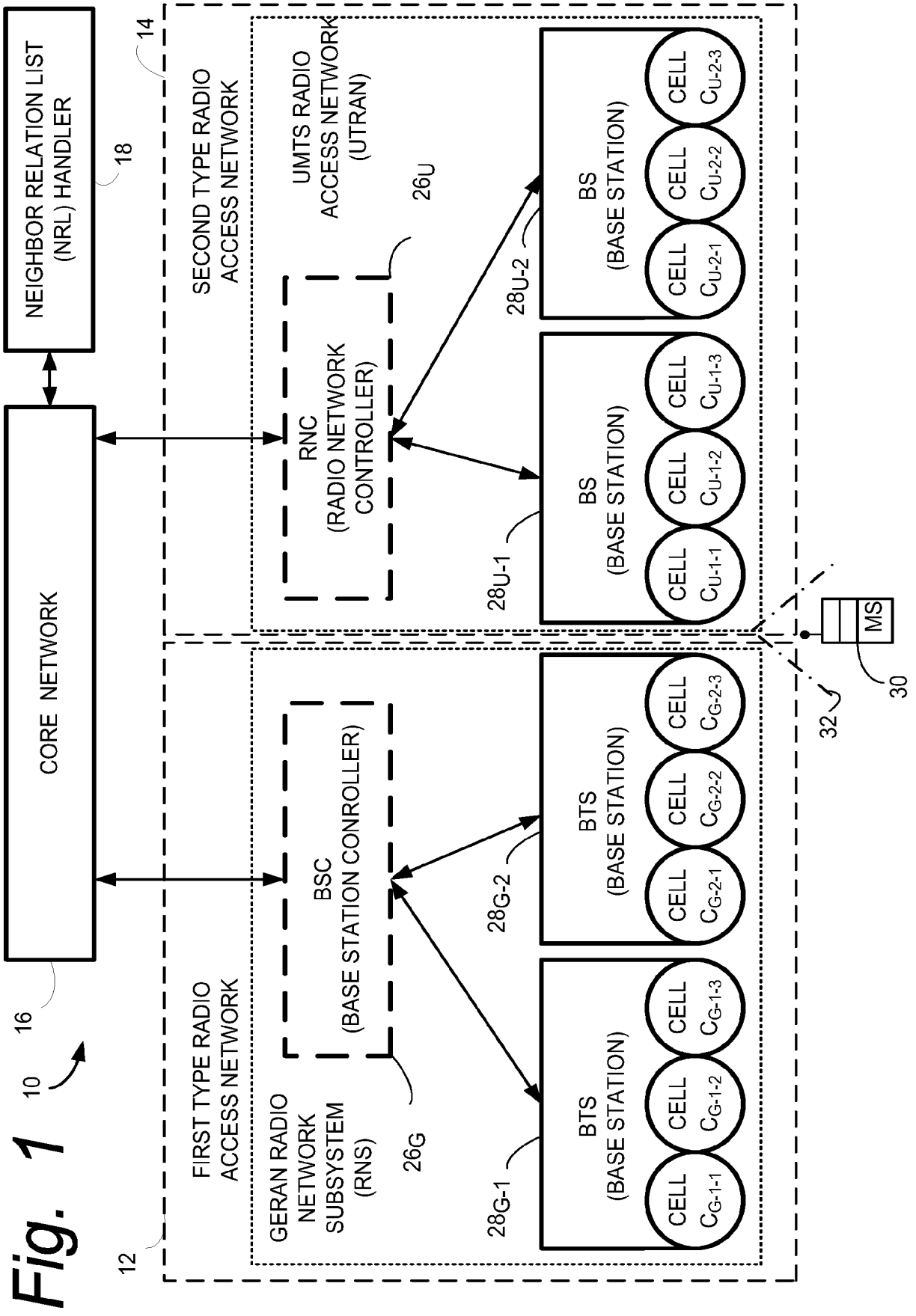

NEIGHBOR RELATION LIST (NRL) HANDLER
18
14
SECOND TYPE RADIO ACCESS NETWORK
UMTS RADIO ACCESS NETWORK (UTRAN)
26U
RNC (RADIO NETWORK CONTROLLER)
28U-2
BS (BASE STATION)
CELL CU-2-1
CELL CU-2-2
CELL CU-2-3
28U-1
BS (BASE STATION)
CELL CU-1-1
CELL CU-1-2
CELL CU-1-3
CORE NETWORK
16
10
12
FIRST TYPE RADIO ACCESS NETWORK
GERAN RADIO NETWORK SUBSYSTEM (RNS)
26G
BSC (BASE STATION CONROLLER)
28G-2
BTS (BASE STATION)
CELL CG-2-1
CELL CG-2-2
CELL CG-2-3
28G-1
BTS (BASE STATION)
CELL CG-1-1
CELL CG-1-2
CELL CG-1-3
32
MS
30

Fig. 1

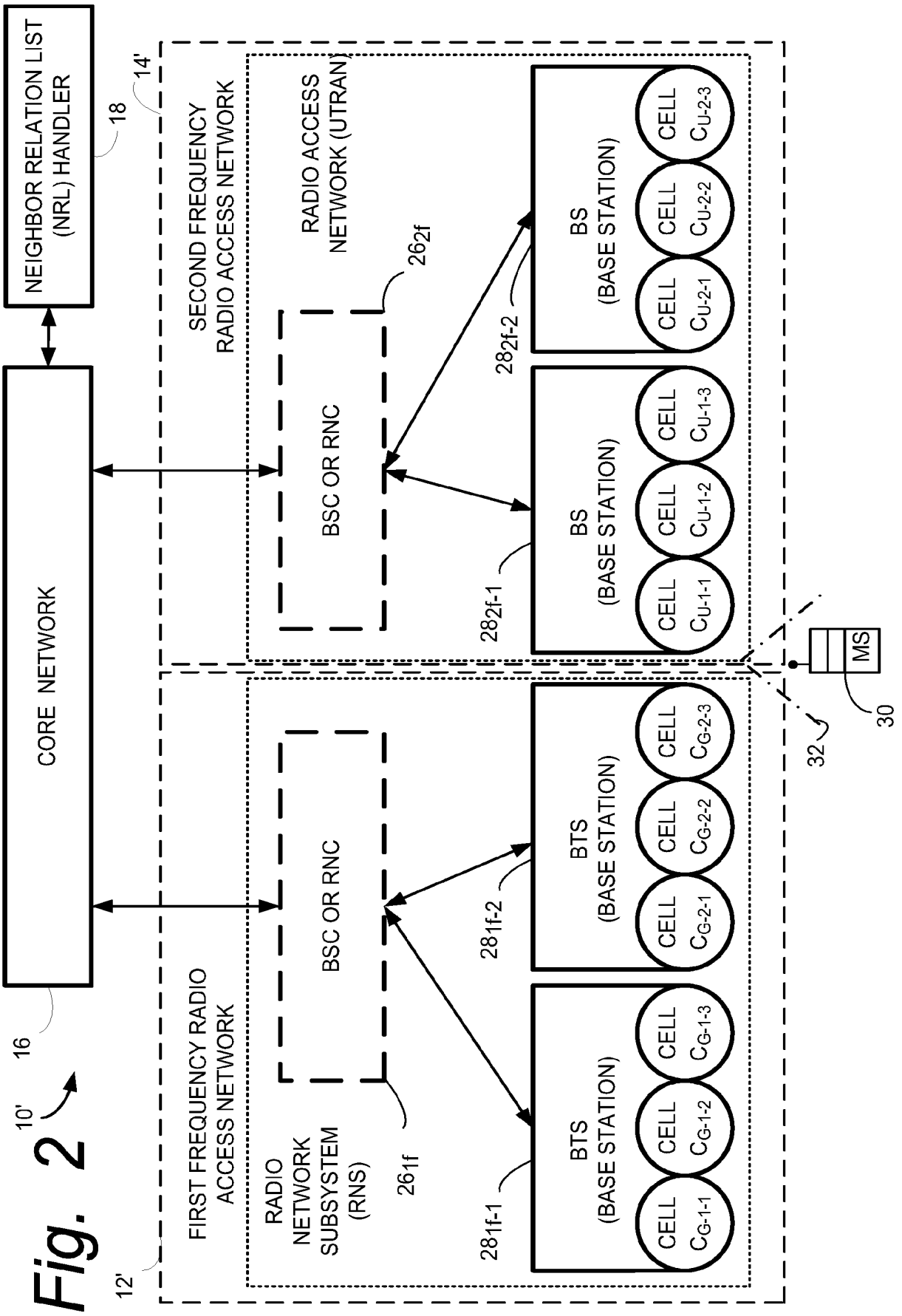

NEIGHBOR RELATION LIST (NRL) HANDLER
18
14'
SECOND FREQUENCY RADIO ACCESS NETWORK
RADIO ACCESS NETWORK (UTRAN)
BSC OR RNC
26_{2f}
28_{2f-2}
28_{2f-1}
BS (BASE STATION)
CELL C_{U-2-1}
CELL C_{U-2-2}
CELL C_{U-2-3}
CELL C_{U-1-1}
CELL C_{U-1-2}
CELL C_{U-1-3}
CORE NETWORK
16
10'
12'
FIRST FREQUENCY RADIO ACCESS NETWORK
RADIO NETWORK SUBSYSTEM (RNS)
BSC OR RNC
26_{1f}
28_{1f-2}
28_{1f-1}
BTS (BASE STATION)
CELL C_{G-2-1}
CELL C_{G-2-2}
CELL C_{G-2-3}
CELL C_{G-1-1}
CELL C_{G-1-2}
CELL C_{G-1-3}
MS
30
32

Fig. 2

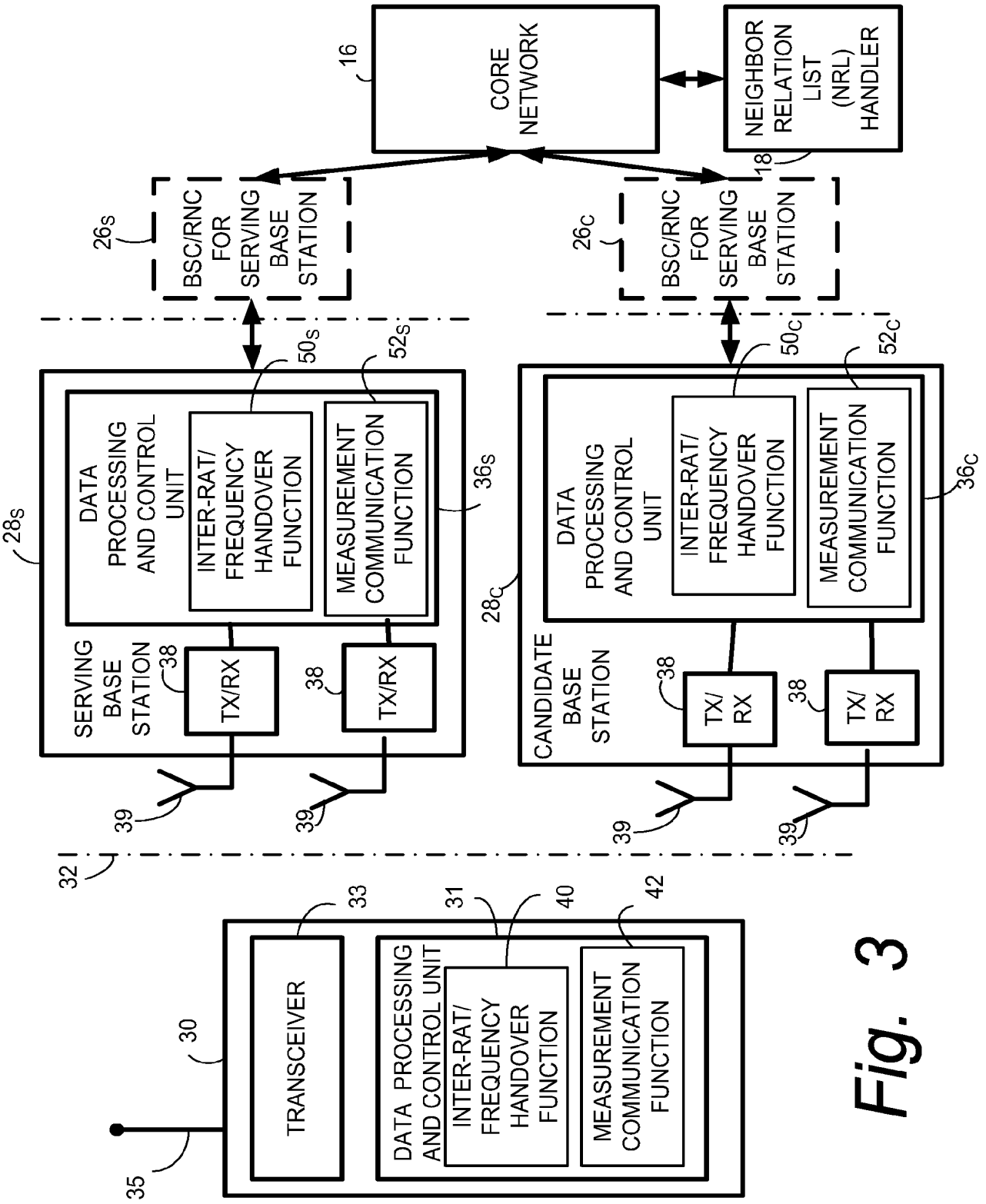

16
CORE NETWORK
NEIGHBOR RELATION LIST (NRL) HANDLER
18
26S
BSC/RNC FOR SERVING BASE STATION
26C
BSC/RNC FOR SERVING BASE STATION
50S
52S
50C
52C
28S
DATA PROCESSING AND CONTROL UNIT
INTER-RAT/ FREQUENCY HANDOVER FUNCTION
MEASUREMENT COMMUNICATION FUNCTION
36S
36C
28C
SERVING BASE STATION
CANDIDATE BASE STATION
38
TX/RX
TX/ RX
39
32
30
33
31
40
42
35
TRANSCEIVER
DATA PROCESSING AND CONTROL UNIT
INTER-RAT/ FREQUENCY HANDOVER FUNCTION
MEASUREMENT COMMUNICATION FUNCTION

Fig. 3

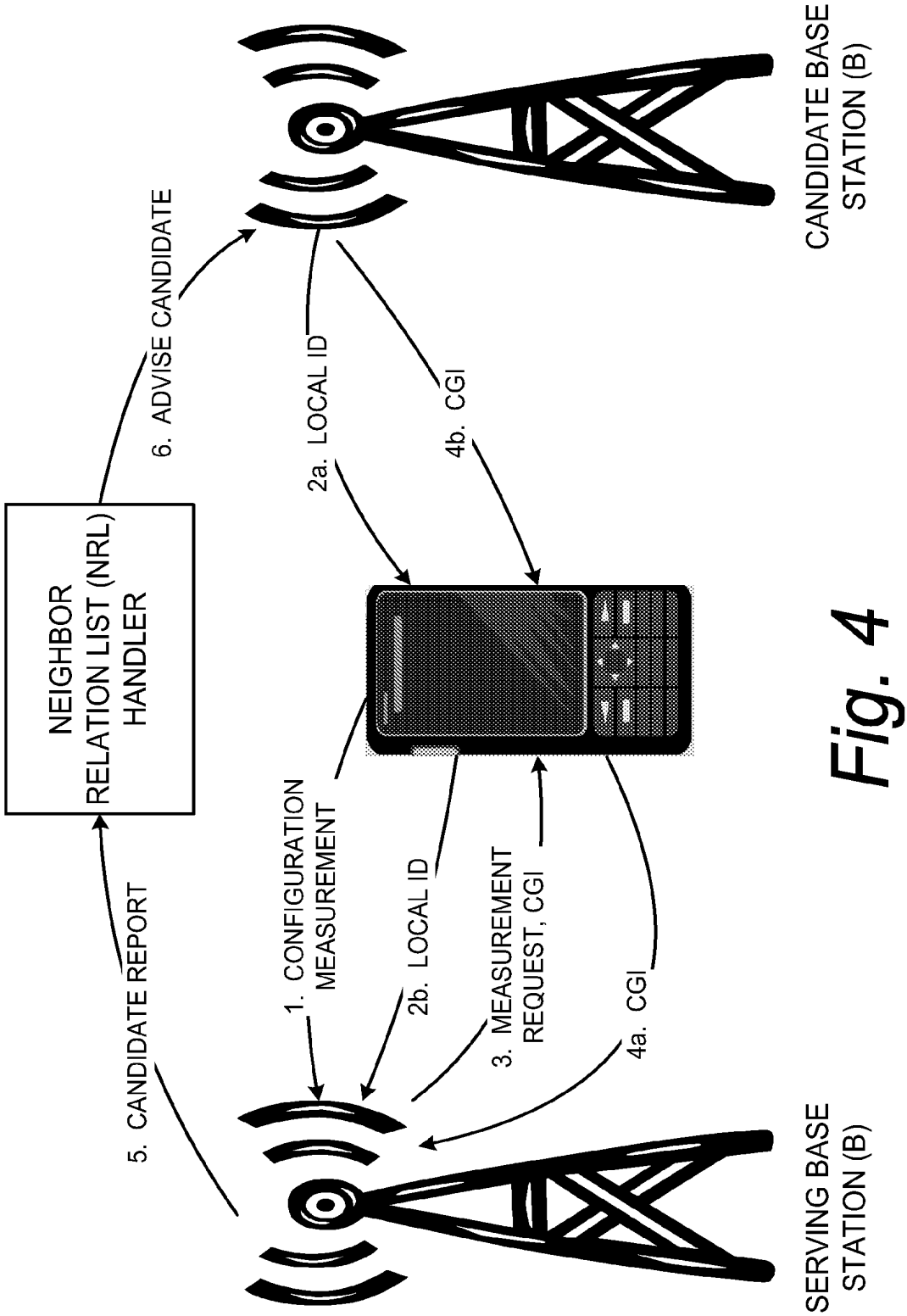

NEIGHBOR RELATION LIST (NRL) HANDLER
6. ADVISE CANDIDATE
5. CANDIDATE REPORT
1. CONFIGURATION MEASUREMENT
2a. LOCAL ID
2b. LOCAL ID
3. MEASUREMENT REQUEST, CGI
4a. CGI
4b. CGI
SERVING BASE STATION (B)
CANDIDATE BASE STATION (B)

Fig. 4

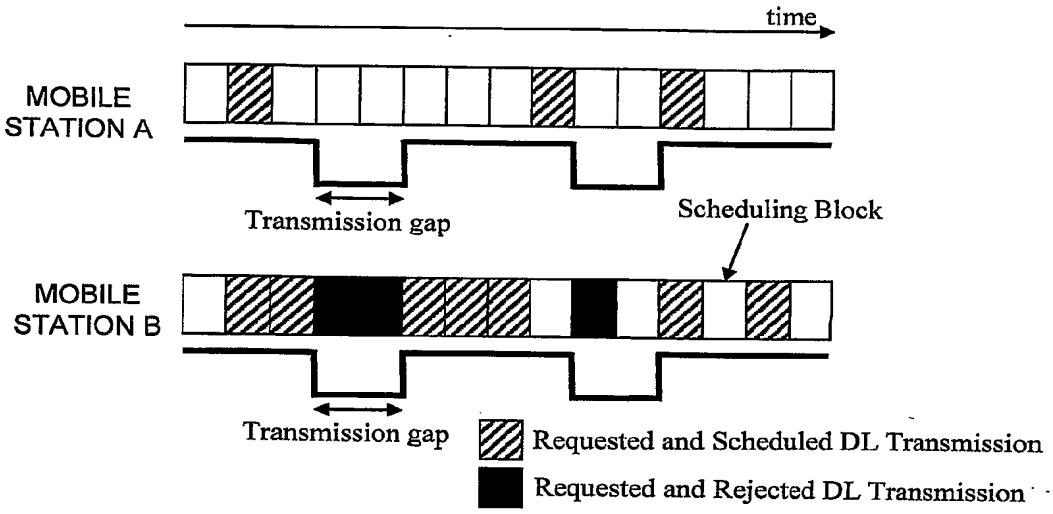

time
MOBILE STATION A
Transmission gap
Scheduling Block
MOBILE STATION B
Transmission gap
Requested and Scheduled DL Transmission
Requested and Rejected DL Transmission

Fig. 5

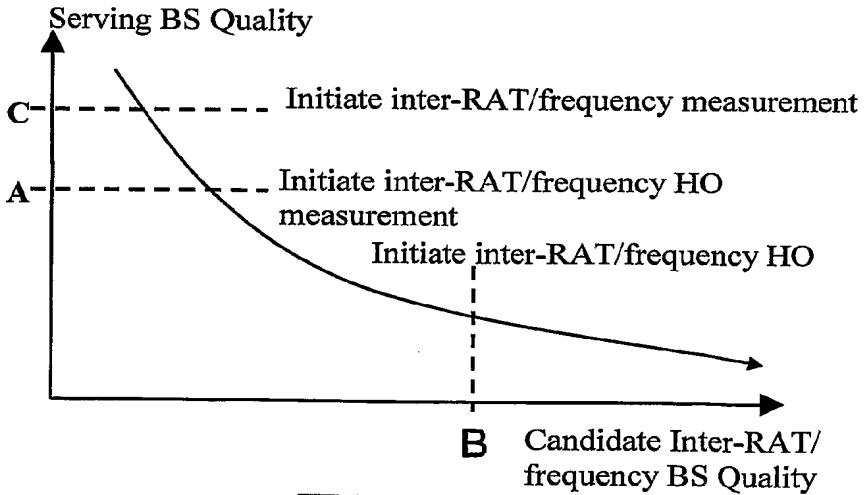

Serving BS Quality
C
Initiate inter-RAT/frequency measurement
A
Initiate inter-RAT/frequency HO measurement
Initiate inter-RAT/frequency HO
B
Candidate Inter-RAT/ frequency BS Quality

Fig. 6

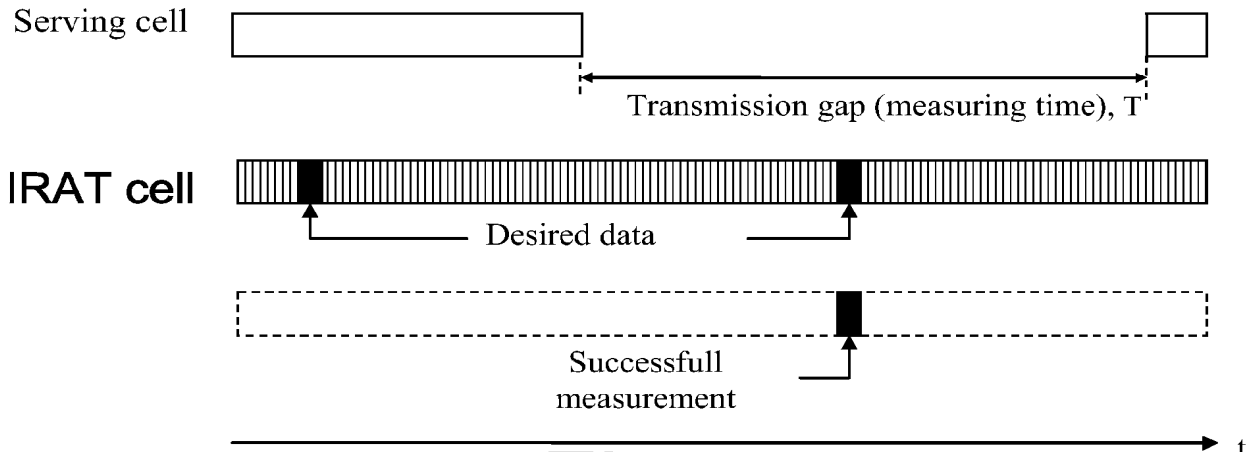


Fig. 7

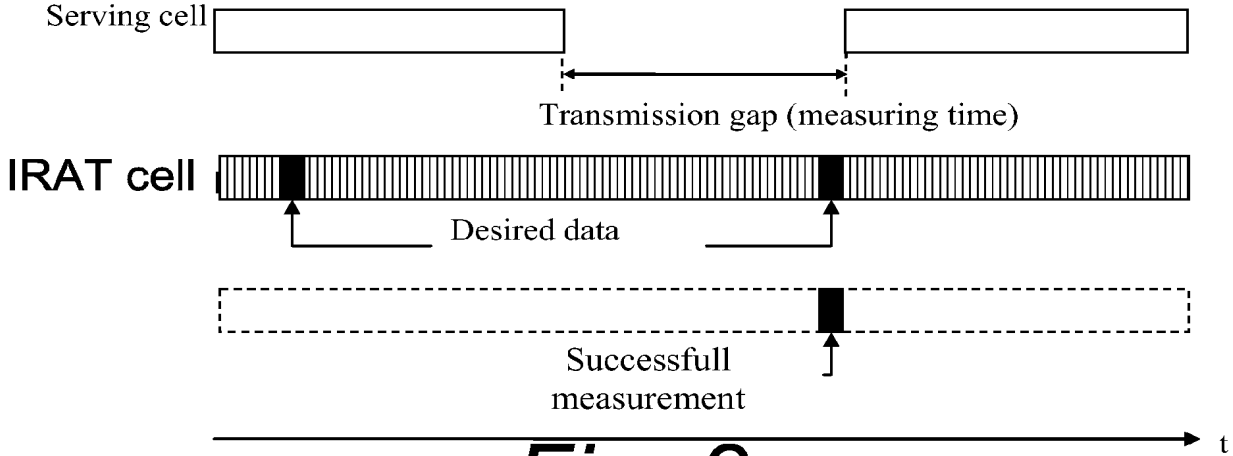


Fig. 8

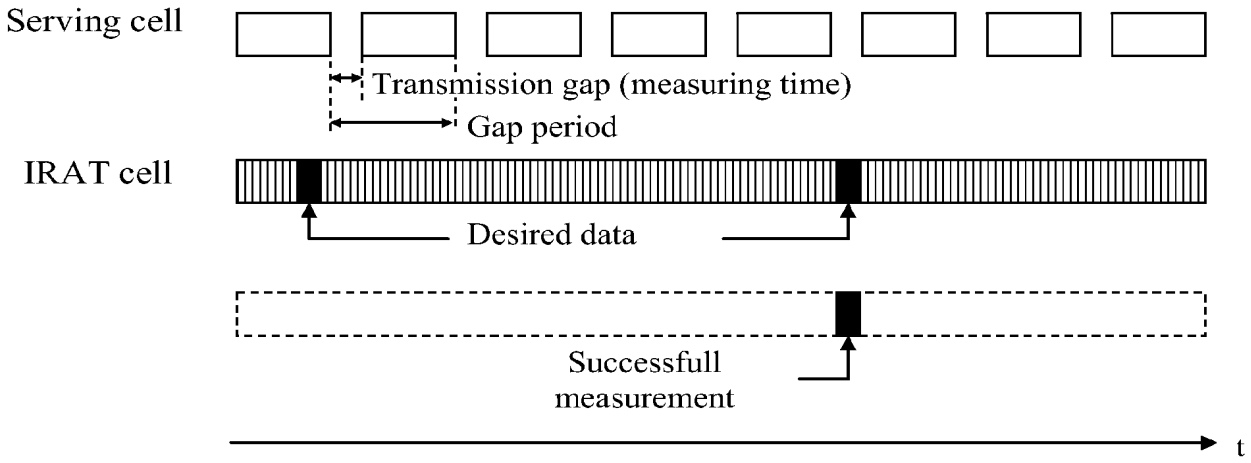


Fig. 9

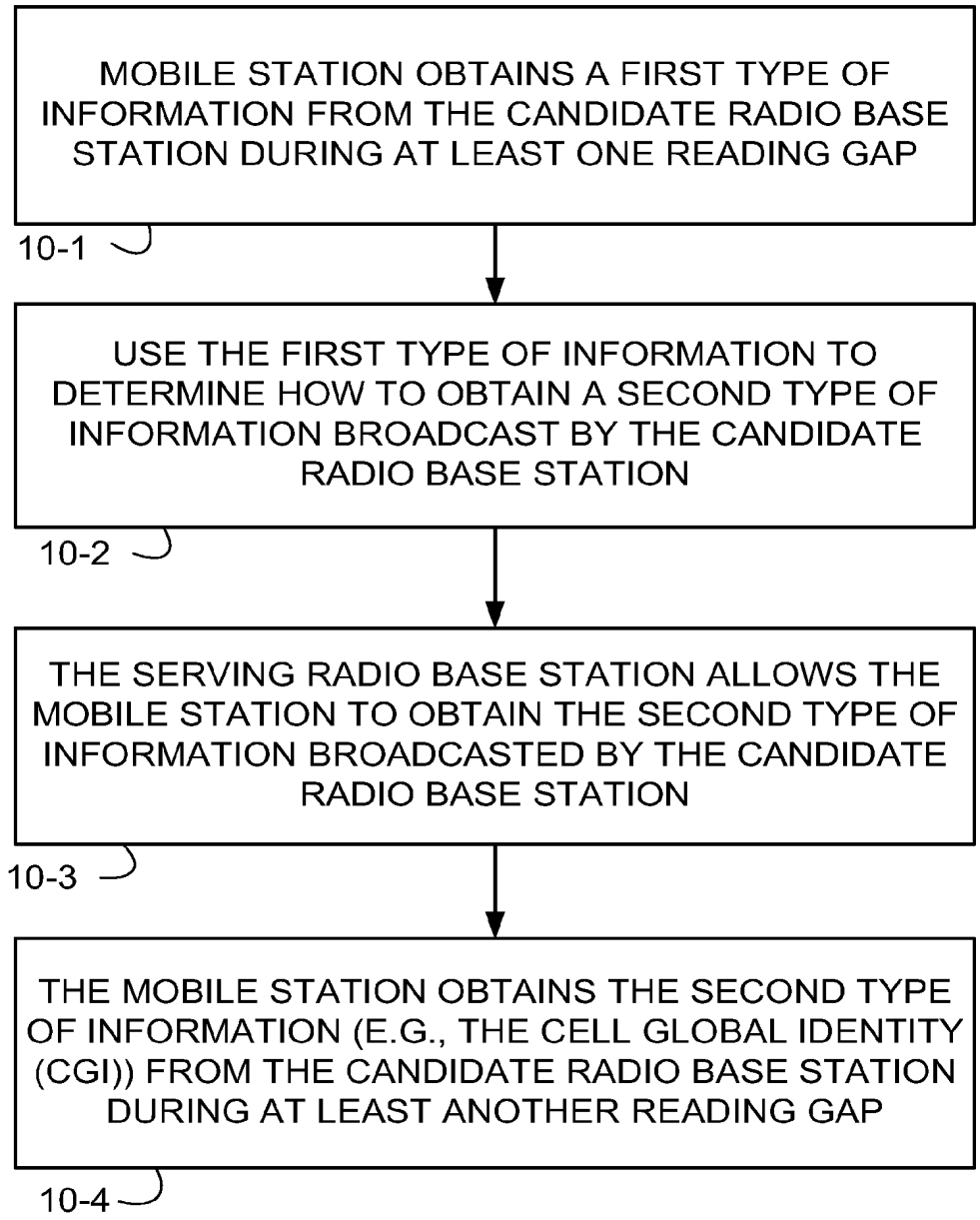

MOBILE STATION OBTAINS A FIRST TYPE OF INFORMATION FROM THE CANDIDATE RADIO BASE STATION DURING AT LEAST ONE READING GAP
10-1
USE THE FIRST TYPE OF INFORMATION TO DETERMINE HOW TO OBTAIN A SECOND TYPE OF INFORMATION BROADCAST BY THE CANDIDATE RADIO BASE STATION
10-2
THE SERVING RADIO BASE STATION ALLOWS THE MOBILE STATION TO OBTAIN THE SECOND TYPE OF INFORMATION BROADCASTED BY THE CANDIDATE RADIO BASE STATION
10-3
THE MOBILE STATION OBTAINS THE SECOND TYPE OF INFORMATION (E.G., THE CELL GLOBAL IDENTITY (CGI)) FROM THE CANDIDATE RADIO BASE STATION DURING AT LEAST ANOTHER READING GAP
10-4

Fig. 10

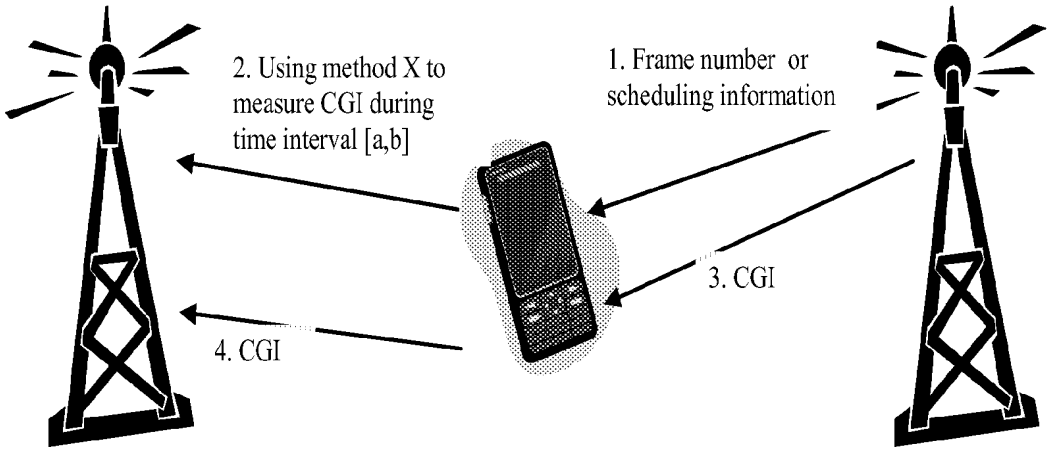

2. Using method X to measure CGI during time interval [a,b]
1. Frame number or scheduling information
3. CGI
4. CGI
Serving BS (A)
Candidate BS (B)

Fig. 11

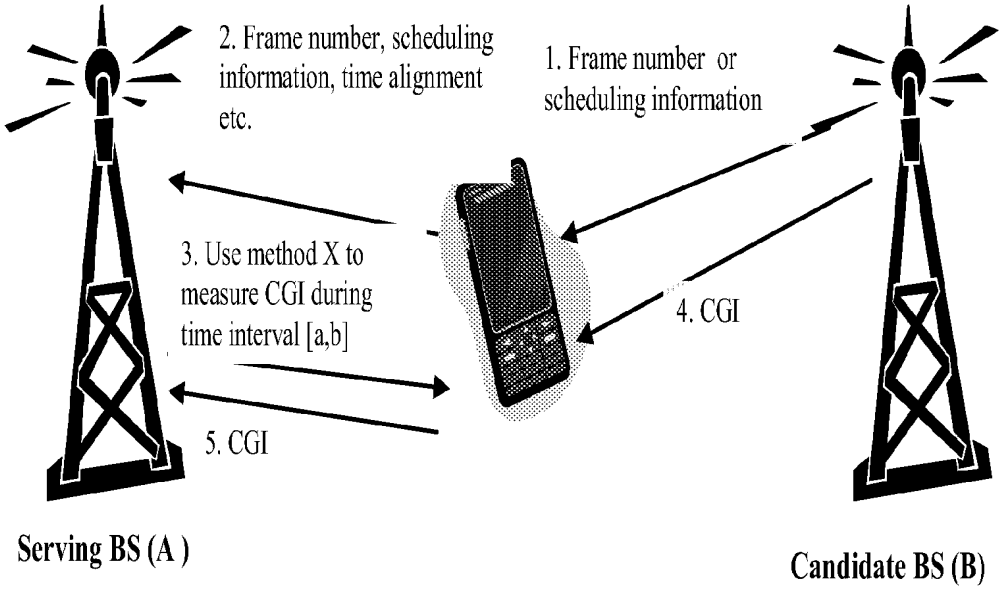

2. Frame number, scheduling information, time alignment etc.
1. Frame number or scheduling information
3. Use method X to measure CGI during time interval [a,b]
4. CGI
5. CGI
Serving BS (A)
Candidate BS (B)

Fig. 12

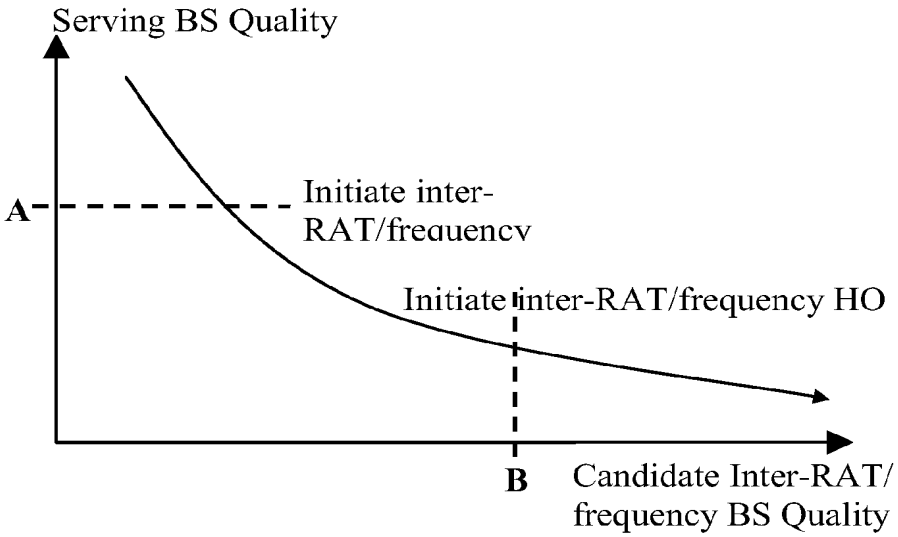

Serving BS Quality
A
Initiate inter-
RAT/frequency
Initiate inter-RAT/frequency HO
B
Candidate Inter-RAT/
frequency BS Quality

Fig. 13

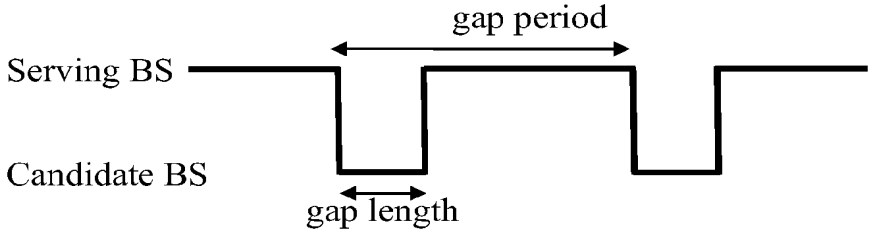

gap period
Serving BS
Candidate BS
gap length

Fig. 14

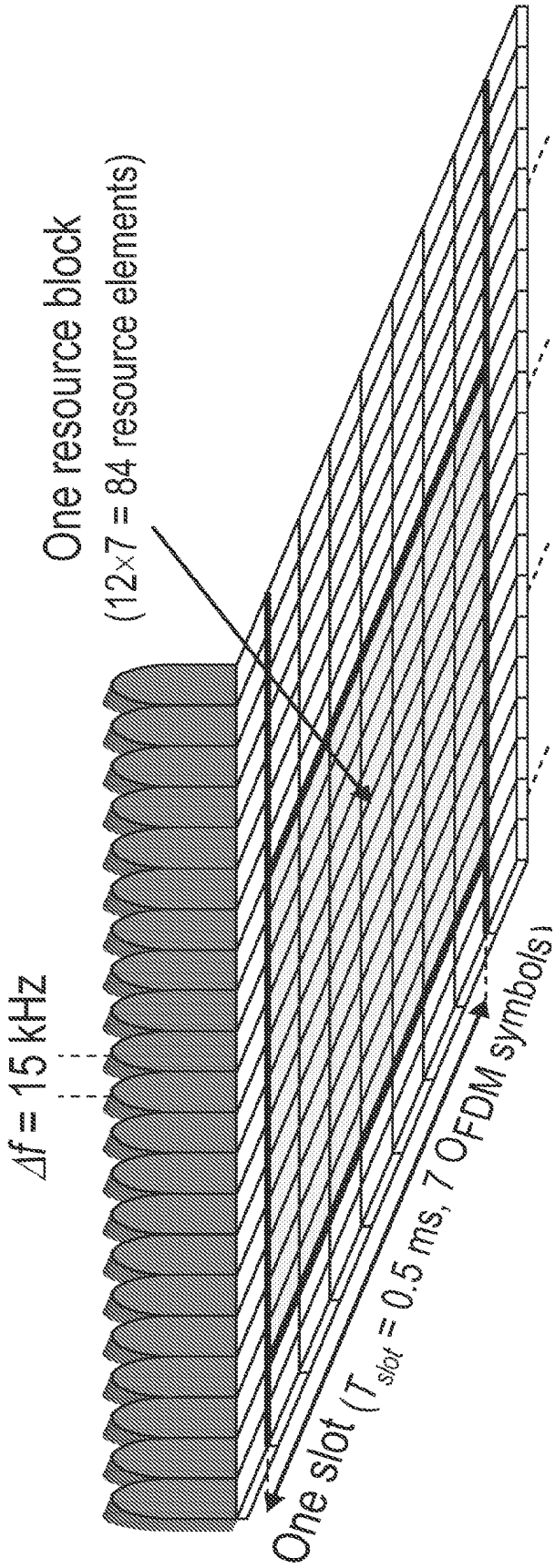

One resource block
(12×7 = 84 resource elements)
Δf = 15 kHz
One slot (T_{slot} = 0.5 ms, 7 OFDM symbols)

Fig. 15

INTERNATIONAL SEARCH REPORT

International application No
PCT/SE2008/051479

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W24/10
ADD. H04W36/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted dunng the international search (name of data base and, where practical, seaVch terms used)

EPO-InternaT

C. DOCUMENTS CONSIDERED TO **BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	US 2007/037601 A1 (MITTAL MUKESH K [US] ET AL) 15 February 2007 (2007-02-15) paragraphs [0009], [0010], [0050], [0051], [0057] - [0063] -----	1,3,4,8, 17-21, 23,25-32
X	QUALCOMM EUROPE: "Scheduling of measurements in LTE" 3GPP DRAFT; R2-060987, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol . tsg_ran\WG2_RL2\TSGR2_52\Documents\Joint_R1_R2, no. Athens, Greece; 20060327, 20 March 2006 (2006-03-20), XP050131036 the whole document ----- -/--	1,4-7, 13,15, 16,23, 24,29

[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

* Special categories of crted documents

'A' document defining the general state of the art which is not considered to be of particular relevance
'E' earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
O ' document referring to an oral disclosure, use, exhibition or other means
'P' document published prior to the international filing date but later than the priority date claimed

'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
'X' document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
'Y' document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such docu¬ments, such combination being obvious to a person skilled in the art
'&' document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 Apri l 2009	21/04/2009
Name and mailing address of the ISA/ European Patent Office, P B 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel (+31-70) 340-2040, Fax (+31-70) 340-3016	Authorized officer Wei nmi l ler, Jost

Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	MOTOROLA: "Measurement Gap Control for E-UTRAN to GERAN Handover, GR-070006" 3GPP RAN-GERAN WORKSHOP ON GERAN/LTE, SOPHIA-ANTIPOLIS, vol. GR-070006, 27 September 2007 (2007-09-27), pages 1-5, XP002501956 paragraphs [0002], [0004]	1,2,4, 15,16, 23,24,29
A	US 2006/223557 A1 (MANOHAR BOLLAPRAGADA V J [US]) 5 October 2006 (2006-10-05) paragraphs [0008], [0050] - [0053]	1-32

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/SE2008/051479

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007037601 A1	15-02-2007	CA 2618525 A1	22-02-2007
		EP 1913791 A2	23-04-2008
		JP 2009505519 T	05-02-2009
		KR 20080035693 A	23-04-2008
		WO 2007022127 A2	22-02-2007
US 2006223557 A1	05-10-2006	CN 101185364 A	21-05-2008
		EP 1867204 A1	19-12-2007
		JP 2008535445 T	28-08-2008
		KR 20080005402 A	11-01-2008
		WO 2006107966 A1	12-10-2006

Electronic Acknowledgement Receipt

EFS ID:	38655588
Application Number:	16224047
International Application Number:	
Confirmation Number:	7372
Title of Invention:	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks
First Named Inventor/Applicant Name:	Ljupco Jorguseski
Customer Number:	20306
Filer:	David A. Grabelsky
Filer Authorized By:	
Attorney Docket Number:	12-678-REI
Receipt Date:	21-FEB-2020
Filing Date:	18-DEC-2018
Time Stamp:	13:56:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	12-678-REI_Information_Disclosure_Statement_21Feb20.pdf	612416 ce78427da210e832d2e63f34e5835b2cbace4dcc	no	4

Warnings:

Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
2	Foreign Reference	WO2009093950.pdf	632719 618fe29f0cda07c2aa1ba8472e86fda831463fa7	no	50
Warnings:					
Information:					
3	Non Patent Literature	NPL1.pdf	83481 846a2e5928bb5f5f48941c9e97f413718575e853	no	13
Warnings:					
Information:					
4	Non Patent Literature	NPL2.pdf	57492 bb93c3ecb82ec9b5a82db33a17a841be8cb681b1	no	4
Warnings:					
Information:					
			Total Files Size (in bytes):	1386108	

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<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
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If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/224,047

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	2200
TOTAL CLAIMS (37 CFR 1.16(i))	15 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	6 minus 3 =	* 3				x 460 =	1380
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	4540

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/224,047	12/18/2018	2642	4540	12-678-REI	15	6

CONFIRMATION NO. 7372

20306
MCDONNELL BOEHNEN HULBERT & BERGHOFF LLP
300 S. WACKER DRIVE
32ND FLOOR
CHICAGO, IL 60606

FILING RECEIPT

OC000000105488845

Date Mailed: 01/31/2019

Receipt is acknowledged of this reissue patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Ljupco Jorguseski, Rijswijk, NETHERLANDS;
Remco Litjens, Voorschoten, NETHERLANDS;
Haibin Zhang, The Hague, NETHERLANDS;
Adrian Victor Pais, Rijswijk, NETHERLANDS;

Applicant(s)

Koninklijke KPN N.V., Rotterdam, NETHERLANDS, Assignee (with 37 CFR 1.172 Interest);

Assignment For Published Patent Application

Nederlandse Organisatie voor Toegepast-Natuurweten schappelijk Onderzoek TNO, s'Gravenhage, NL

Power of Attorney: The patent practitioners associated with Customer Number 20306

Domestic Priority data as claimed by applicant

This application is a REI of 13/516,905 06/18/2012 PAT 8626175
which is a 371 of PCT/EP2010/069908 12/16/2010

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
EUROPEAN PATENT OFFICE (EPO) 09180130.8 12/21/2009 No Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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If Required, Foreign Filing License Granted: 01/30/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/224,047**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

Preliminary Class

455

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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PTO/AIA/80 (07-12)
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

■ Practitioners associated with Customer Number: 20306

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number

Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

■ The address associated with Customer Number: 20306

OR

☐	Firm or Individual Name			
	Address			
	City		State	Zip
	Country			
	Telephone		Email	

Assignee Name and Address: Koninklijke KPN N.V.
Maanplein 55
2516 CK, The Hague, Netherlands

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date	23 November 2012
Name	K.M. Weyts	Telephone	+31 70 3433955
Title	Chief Intellectual Property Officer		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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☒ Practitioners associated with Customer Number: 20306

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

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☒ The address associated with Customer Number: 20306

OR

☐	Firm or Individual Name			
	Address			
	City		State	Zip
	Country			
	Telephone		Email	

Assignee Name and Address: Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek TNO
Anna van Buerenplein 1
NL-2595 DA 's-Gravenhage
Netherlands

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SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	/Joost de Bruin/	Date	
Name	Joost P. de Bruin	Telephone	
Title	manager (a.i.) IP&Contracting TNO		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	2018-12-18
First Named Inventor	Jorguseski, Ljupco
Art Unit	
Examiner Name	
Attorney Docket Number	12-678-REI

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	8301162	B2	2012-10-30	Ward	

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20080051129	A1	2008-02-28	Abe et al.	
	2	20040002328	A1	2004-01-01	Chandra et al.	
	3	20070004394	A1	2007-01-04	Chu et al.	

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	1	WO1997/31502	WO		1997-08-28	Telefonaktiebolaget LM Ericsson		

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2018-12-18
	First Named Inventor	Jorguseski, Ljupco
	Art Unit	
	Examiner Name	
	Attorney Docket Number	12-678-REI

	2	EP2076093	EP	A1	2009-07-01	France Telecom		

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	PCT International Search Report and Written Opinion, PCT International Application No. PCT/EP2010/069908 dated May 13, 2011.	
	2	European Search Report, European Patent Application No. 09180130.8 dated August 9, 2010.	
	3	"3rd Generation Partnership ProJect: Technical Specification Group Radio Access Network; Stage 2 Functional Specification of Location Services in UTRAN", 3G TS 25.305 V2.0.0., December 1999, pp. 1-38.	

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	2018-12-18
	First Named Inventor	Jorguseski, Ljupco
	Art Unit	
	Examiner Name	
	Attorney Docket Number	12-678-REI

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/David A. Grabelsky/	Date (YYYY-MM-DD)	2018-12-18
Name/Print	David A. Grabelsky	Registration Number	59,208

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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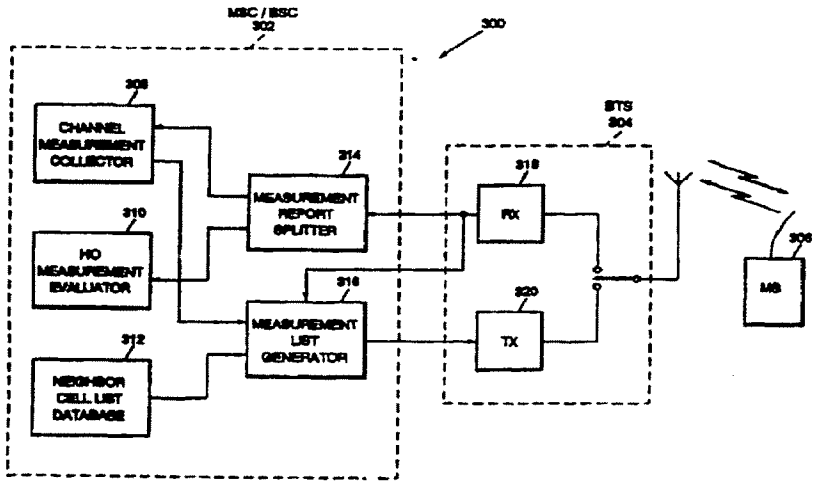
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(57) Abstract

A method and system for measuring signal level in a telecommunications system having a mobile assisted handoff (MAHO) feature. The method and system utilizes the MAHO feature to perform signal level measurements, at a mobile station, on channels other than handoff measurement channels on which signal level is measured for MAHO purposes. Use of the method and system reduces the effects of making additional measurements on the efficiency of the MAHO process. A system operator may obtain signal level measurements for various purposes other than MAHO without adversely affecting the MAHO process.

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METHOD AND SYSTEM FOR MEASURING SIGNALS IN A TELECOMMUNICATIONS SYSTEM HAVING MAHO

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to mobile telecommunications systems, and more particularly, to a method and system for measuring RF signals in a cellular telecommunications system having a mobile assisted handoff feature.

Description of the Prior Art

In cellular mobile telecommunications systems it is often necessary to measure signal levels, on selected channels of the system, at a mobile station for different purposes. At certain times, resources for making measurements at the mobile station may be limited and it may be difficult to obtain an accurate set of measurements when it is desired to measure signal levels on a large number of channels at one time.

One task that uses resources required for making signal level measurements at a mobile station is the mobile assisted handoff (MAHO) task. MAHO is a process by which control of a call involving a mobile station is transferred from base station to base station as the mobile station moves throughout the system. Examples of systems in which MAHO has been implemented, include digital systems that operate according to the EIA/TIA IS-54B and IS-136 systems.

In IS-54B and IS-136 systems, the time division multiple access (TDMA) signal transmission mode is used. In TDMA, communications between a base station and a

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particular mobile station are transmitted on radio channels that also may be used for communications between the same base station and up to two different mobile stations. The communications are carried out through data or digitized voice signals that are transmitted as bursts in timeslots that are time multiplexed on the radio channels. Each mobile station in communication with a base station is assigned a timeslot on both the reverse channel and forward channels. The assigned timeslots are unique to each mobile station so communications between different mobiles do not interfere with each other.

A MAHO handoff process is specified to be used in the IS-54B and IS-136 standards, MAHO handoff measurement is done at the mobile station during the times when the mobile station is neither transmitting in the assigned reverse channel timeslot nor receiving in the assigned forward channel timeslot. In the MAHO process, during the times between signal bursts in an ongoing call, the mobile station periodically monitors radio channels (handoff measurement channels) of each base station located in close proximity to the base station with which the call is proceeding. The control channel of each neighboring base station is typically used as the handoff measurement channel. For each mobile station included in an ongoing call, the handoff measurement channels measured are contained in the neighbor cell list of the cell in which the call is proceeding. In addition to measuring the handoff measurement channels of neighboring base stations during an ongoing call, the mobile station also measures the received signal strength on the current channel on which the call is proceeding.

The mobile station measures the received signal strength on the handoff measurement channels and current channel and transmits the measurement results to the current base station. The current base station then forwards these measurement results to the MSC. If the received signal strength on the current channel falls below the received signal strength on a handoff measurement channel of a neighboring cell, the MSC initiates handoff to that neighboring cell.

The analog control channels (ACCH) of the neighboring cells are used as the handoff measurement channels for IS-54B MAHO. In IS-136 MAHO the digital control channels (DCCHs) of the neighboring cells are used as the handoff measurement channels for MAHO.

Because MAHO is performed mostly within the mobile station the resources for carrying out the process are limited. IS-54B or IS-136 mobile stations can perform only fifty measurements per second. Radio conditions such as Rayleigh fading, shadowing, etc. are such that it is necessary to average measurements in order to provide a reliable signal strength value. Therefore, it is necessary to limit the number of cells that comprise the neighbor cell list for MAHO measurement purposes to much less than fifty cells. The IS-54B standard limits the size of the neighbor cell list to twelve cells. IS-136 sets a size limit of twenty four. The increase in the size of the list in IS-136 over IS-54B has limited effect because the limit of fifty measurements per second still holds and any increase in the number of cells in the list dilutes signal strength measurement precision on any given handoff measurement channel.

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At certain times it may be necessary to measure signal level at a mobile station on channels for purposes other than MAHO. Then number of channels on which it is derived to measure signal level may be quite large relative to the number of channels in the neighbor cell list. Because the MAHO process is resource intensive, as far as requiring use of resources available for making handoff measurements at a mobile station, it is difficult to obtain signal level measurements at the mobile station for other purposes without affecting the efficiency and accuracy of the MAHO process.

For example, measurements at the mobile station for purposes other than MAHO may be necessary in a system using adaptive channel allocation. In a system using adaptive channel allocation, a communications channel of the system may be assigned to any cell of the system. In this type of system, an adaptive channel allocation process is used in which interference measurements are done on available system communications channels within a particular cell. When it is necessary to allocate a communication channel for voice or traffic communications within the cell, one of the least interfered available channels is then allocated.

As for any signal level measurements, a greater accuracy in adaptive channel allocation is achieved by making a large as possible number of measurements including measurements during ongoing calls and measurements made at a mobile station. Since MAHO measurement resources are limited, in a system using both MAHO and adaptive channel allocation, it would be difficult to obtain the necessary signal level

measurements at a mobile station with a desired accuracy. The same problem occurs when signal level measurements are to be made for purposes other than adaptive channel allocation.

It would provide an advantage then, in a cellular system having a MAHO function, to have a method and system for efficiently measuring RF signal levels at a mobile station while minimizing the effect of the measurements on the efficiency of the MAHO process.

SUMMARY OF THE INVENTION

The present invention provides a method and system for measuring RF signals in a cellular telecommunications system having a mobile assisted handoff (MAHO) feature.

The method and system utilizes the mobile assisted handoff measurement process to measure signal levels, at a mobile station, on additional channels other than handoff measurement channels on which signal level is measured for MAHO purposes. Use of the method and system allows signal level measurements to be made on the additional channels and on handoff measurement channels using a single neighbor cell list. Use of the method and system minimizes the effect of making measurements on the additional channels at the mobile station on the efficiency of the MAHO measurement process. The results of the measurements made on the additional channels can be utilized by the system operator as desired. For example, the additional channels may be channels that are adaptively allocated throughout the system and the measurement results on the additional channels may be used in the adaptive channel allocation process.

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In an embodiment of the invention, additional channels to be measured are selectively added to a modified MAHO neighbor cell list that contains selected handoff measurement channels for a particular cell of the system. The additional channels and handoff measurement channels form a modified measurement list. The modified measurement list is then used in the MAHO measurement process to obtain signal level measurements on each channel in the list.

The additional channels are measured by transmitting measurement lists for measurement as a mobile station operates in a cell. Each measurement list is of a predetermined size, contains a predetermined number of handoff measurement channels and a predetermined number of additional channels. As a call is ongoing, different measurement cell lists are transmitted to the mobile station. For each neighbor cell list transmitted to the mobile station, at least one of the additional channels or, at least one of the handoff measurement channels, of the last previously transmitted neighbor cell list has been replaced with a different additional channel or different handoff measurement channel. The additional channels and handoff measurement channels may be replaced one at a time or, as a group of more than one, so that the neighbor cell list remains of a predetermined size. The process of transmitting modified measurement cell lists and making measurements continues until the call is terminated. The additional channels may be added to the measurement list in a different order for different mobile stations operating in the cell.

The process may be repeated during each call, until a desired set of measurements has been obtained on the set of additional channels.

Signal level measurements may be made on N available handoff measurement channels contained in an initial measurement list that is transmitted to the mobile station at call setup. The Y handoff measurement channels having the Y highest signal levels of measurements made on the N available handoff measurement channels may then be selected as the handoff channels to be included in the measurement list. The number of additional channels to be included in the list along with the handoff measurement channels may then be chosen so that the measurements list remains of a size of N channels. Alternatively, the handoff measurement channels may be selected by choosing all handoff measurement channels having a signal level above a predetermined threshold and a number of additional measurement channels can be added to create a list of a desired size. The size of the neighbor cell list may be determined by system standards and efficiency considerations. As the call is ongoing, the handoff measurement channels in the measurement list can be replaced by other handoff measurement channels and, measurements made to verify that the handoff measurement channels in the measurement list conform to the criteria by which they were selected.**BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 illustrates ten cells within a cellular telecommunications system of the type to which the present invention generally pertains;

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FIG. 2 shows the cells of the system shown in FIG. 1 with additional cells;

FIG. 3 is a block level diagram of portions of a cellular system according to an embodiment of the invention; and

FIG. 4 is a flow diagram illustrating steps performed within a cellular telecommunications system according to an embodiment of the invention.

DETAILED DESCRIPTION

Referring to FIG. 1, there is shown a portion of a conventional cellular radio communication system of the type to which the present invention generally pertains. In FIG. 1, an arbitrary geographic area may be divided into a plurality of contiguous radio coverage areas, or cells Cell A-Cell J. While the system of FIG. 1 is illustratively shown to include only ten cells, it should be clearly understood that in practice, the number of cells will be much larger.

Associated with and located within each of Cell A-Cell J is a base station designated as a corresponding one of a plurality of base stations B1-B10. Each of the base stations B1-B10 includes a transmitter, a receiver, and a base station controller as are well known in the art. In FIG. 1, the base stations B1-B10 are illustratively located at the center of each of Cell A-Cell J, respectively, and are equipped with omni-directional antennas. However, in other configurations of the cellular radio system, the base stations B1-B10 may be located near the periphery, or otherwise away from the center of the Cell A-Cell J and may illuminate Cell A-Cell

J with radio signals either omni-directionally or directionally. Therefore, the representation of the cellular radio system of FIG. 1 is for purposes of illustration only and is not intended as a limitation on the possible implementations of the cellular radio system within which the present invention is implemented.

With continuing reference to FIG. 1, a plurality of mobile stations M1-M10 may be found within Cell A-Cell J. Each of the mobile stations M1-M10 includes a transmitter, a receiver, and a mobile station controller as are well known in the art. Again, only ten mobile stations are shown in FIG. 1 but it should be understood that the actual number of mobile stations will be much larger in practice and will invariably greatly exceed the number of base stations. Moreover, while none of the mobile stations M1-M10 may be found in some of Cell A-Cell J, the presence or absence of the mobile stations M1-M10 in any particular one of Cell A-Cell J should be understood to depend in practice on the individual desires of users of the mobile stations M1-M10, who may roam from one location in the cell to another or from one cell to an adjacent cell or neighboring cell, and even from one cellular radio system served by an MSC to another such system.

Telephone calls may be initiated or received at each of the mobile stations M1-M10 through one or more of the base stations B1-B10 and a mobile station switching center (MSC). A mobile station switching center (MSC) is connected by communication links, e.g., cables, to each of the illustrative base stations B1-B10 and to the fixed public switched telephone network (PSTN), not shown, or a similar fixed network which may include an integrated

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system digital network (ISDN) facility. The relevant connections between the mobile station switching center (MSC) and the base stations B1-B10, or between the mobile station switching center (MSC) and the PSTN or ISDN, are not completely shown in FIG. 1 but are well known to those of ordinary skill in the art. Similarly, it is also known to include more than one mobile station switching center in a cellular radio system and to connect each additional mobile station switching center to a different group of base stations and to other mobile station switching centers via cable or radio links.

Each MSC may control in a system the administration of communication between each of the base stations B1-B10 and the mobile stations M1-M10 in communication with it. As a mobile station roams about the system, the mobile station registers its location with the system through the base stations that control the area in which the mobile station is located. When the mobile station telecommunications system receives a call addressed to a particular mobile station, a paging message addressed to that mobile station is broadcast on control channels of the base stations which control the area in which the mobile station is believed to be located. Upon receiving the paging message addressed to it, the mobile station scans system access channels and sends a page response to the base station from which it received the strongest access channel signal. The process is then initiated to create the call connection. The MSC controls the paging of a mobile station believed to be in the geographic area served by its base stations B1-B10 in response to the receipt of a call for that mobile station, the assignment

of radio channels to a mobile station by a base station upon receipt of a page response from the mobile station, as well as the handoff communications with a mobile station from one base station to another in response to the mobile station traveling through the system, from cell to cell, while communication is in progress.

Each of Cell A-Cell J is allocated a plurality of voice or speech channels and at least one control channel, such as an analog control channel (ACCH) or digital control channel (DCCH). The control channel is used to control or supervise the operation of mobile stations by means of information transmitted to and received from those units. Such information may include call originations, page signals, page response signals, location registration signals and voice channel assignments.

The method and system of the invention may be implemented into a system similar to that shown in FIG. 1 that utilizes a mobile assisted handoff function. The handoff may be done by the method of mobile assisted handoff (MAHO) specified in commonly assigned U.S. Patent No. 5,200,957 to Dahlin, which is hereby incorporated by reference. During the procedure for call setup on digital communication channel, the base station informs the mobile station of radio channel frequency and also of a timeslot that identifies the timeslot to be used and digital voice color code (DVCC). During the call setup procedure, the base station also informs the mobile station of a plurality of DCCH channels the signal strength of which are to be measured by the mobile for handoff purposes.

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This plurality of DCCH channels are the DCCH channels of cells which comprise the neighbor cell list.

Referring now to FIG. 2, therein are shown the cells of the system shown in FIG. 1 with additional cells. Each of the cells shown in FIG. 2 has a DCCH associated with it. As a mobile station involved in an ongoing call moves among Cell A-Cell S of FIG. 2, measurements are made on DCCH channels of neighbor cells that are contained in the neighbor cell list. The system will handoff control of call communications from cell to cell based on these measurement results. Depending upon the movement of the mobile station, as well as other circumstances, each time a handoff occurs a new plurality of DCCH channels will be selected and the corresponding neighbor cell list transmitted to the mobile station from the responsible base station during the course of the connection. During the course of the connection the mobile station measures the signal strength of signals on the given plurality of DCCH channels. Measurements are done during time slots not used by the digital communication channel.

The mobile station also measures signal strength on the digital communication channel used for the established connection and the bit error rate on the established connection. The mobile station transmits results of its measurements, preferably averaged, frequently to the base station, preferably twice a second.

The base station also measures signal strength on the digital communication channel used for the established connection and the bit error rate on the established connection. The base station processes and analyzes the results of its own measurements and the measurements of

the mobile station for comparison with handoff criteria. When, according to the results and criteria, a handoff is desired, the base station informs the mobile switching center indicating at least one target base station assumed suitable for taking over the responsibility for the communication with the mobile.

The mobile switching center requests the target base station(s) to measure signal strength on a radio channel in the timeslot used by the mobile for the established connection. The mobile switching center also informs the target base station on the digital color code used by the mobile station.

The target base station(s) tune(s) a receiver to the radio channel indicated by the mobile switching center and uses the timeslot identifier of the indicated timeslot for burst synchronization. The target base station checks the appearance of the digital verification color code indicated by the mobile switching center and measures the signal strength of the burst signal provided the digital verification color code is correct. The target base station then transmits the results of the signal strength measurement to the mobile switching center. The target base station also informs the mobile switching center on the result of the checking of the appearance of the digital verification color code, i.e., whether the digital verification color code appeared in the burst in the timeslot of the radio channel.

The mobile switching center determines whether handoff to a target base station should be performed taking the results of the signal strength measurements of

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target base(s) into account as well as other circumstances, e.g., traffic load.

The target base stations may be ranked according to measured signal level on the measurement channel of each base station or, alternatively, according to measured signal level on the measurement channel of each base station and a ranking penalty which is determined by cell characteristics such as transmitter power or cell size. The cells of all target base stations may be assigned a ranking value. For example, a ranking value for cell i could be calculated as follows:

$$R_i = SS_i(dB) - P_i$$

where SS_i is measured signal level and P_i is the ranking penalty of Cell i. For example, P_i could be set higher for cells carrying a heavy load of call traffic.

In order to avoid a large number of handoffs for fast moving mobile stations in a system having macro and micro cells, it is desirable to hand a fast moving mobile station off to larger macro cells. Let T be the time value of a timer started when a threshold signal level is detected on the measurement channel of a candidate cell. In this case the ranking value of Cell i could be calculated as follows:

$$R_i = SS_i(dB) - P_i - P_{tempi} \bullet H(T-T_{tempi})$$

where P_{tempi} is an extra ranking penalty applied during the limited time period duration T_{tempi}. The function H is such that:

$$H(x) = \begin{cases} 1, X<0 \\ 0, X\geq 0 \end{cases}$$

If the mobile station moves fast in relation to the size of a microcell it will pass the microcell without making a handoff to the microcell, even though the microcell has a high signal level strength as measured at the mobile station. If the mobile station moves slow, $H(T-T_{temp_1})$ may become 0 and, the microcell may rise in the handoff candidate rankings.

The method and system of the embodiment is implemented into an IS-136 system such as the system shown in FIGS. 1 and 2.

Referring now to FIG. 3, therein is shown a block level diagram of portions of a cellular system according to an embodiment of the invention. The cellular system includes mobile switching center/base station controller (MSC/BSC) 302, base transceiver station (BTS) 304 and mobile station (MS) 306. The BTS 304 comprises receiver equipment (RX) 318, and transmitter equipment (TX) 320. MSC/BSC 302 comprises a channel measurement collector 308, handoff (HO) measurement evaluator 310, neighbor cell list database 312, measurement report splitter 314 and measurement list generator 316. The functions of the functional blocks illustrated in FIG. 3 may be implemented in hardware and/or software. The functional blocks located within MSC/BSC 302 may be implemented in either the MSC or BSC separately or may be allocated between the MSC and BSC. One skilled in the art will realize that

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various combinations of hardware and software may be used to implement these functions.

The functional blocks of FIG. 3 may be used to perform process steps for performing signal measurements according to an embodiment of the invention.

Referring now to FIG. 4, therein is a flow diagram illustrating steps performed within a cellular telecommunications system according to an embodiment of the invention. The individual steps are performed for each call involving each mobile station operating within the system. FIG. 4 may be described with reference to the functional blocks of FIG. 3.

The process begins at Step 402 when the user of a mobile station initiates a call or a call is received in the base station for a mobile station operating within the coverage area of the base station.

Next, at Step 404, measurement list generator 316 forms an initial neighbor list using the neighbor cell list database 312. The initial neighbor cell list contains N handoff measurement channels. These N handoff measurement channels are the DCCHs of the N best candidate handoff neighbor cells. The measurement list generator 316 transfers the initial measurement list to TX 320. Then, Step 406, BTS 304 transmits the initial measurement channel list containing N handoff measurement channels to mobile station 306.

Next, at Step 408, mobile station 306 performs measurements on the N handoff measurement channels in the initial measurement list and returns the results to BTS 304. Receiver 318 receives the measurement results and transfers the results to measurement list generator 316.

The process then moves to Step 410 where measurement list generator 316 determines the Y handoff measurement channels having the strongest received signal strengths of the N handoff measurement channels in the initial neighbor measurements list. Measurement list generator 316 then removes the N-Y handoff measurement channels having the weakest received signal strengths from the measurement list.

As an alternative to retaining only the Y handoff measurement channels having the strongest received signal strengths, all handoff measurement channels having a signal strength below a predetermined level, or, below a predetermined level in reference to the signal strength of the channel carrying the call could be removed from the list, with the handoff measurement channels remaining in the list forming the Y handoff measurement channels.

As another alternative to Step 410, the Y handoff measurement channels having the highest ranking value, as a function of both a ranking penalty and a measured signal level, are kept in the measurement list of N handoff measurement channels. The ranking may be determined as previously described. If the ranking function involves use of a temporary ranking penalty, the temporary ranking should be removed before the Y measurement channels are selected.

Next, at Step 412, measurement list generator 316 determines N-Y other measurement channels by accessing channel measurement collector 308, and then adds these N-Y other measurement channels to the neighbor list to form a modified measurement list. The modified measurement list is then transferred by measurement list generator 316

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to transmitter 320. The process then moves to Step 414. At Step 414 BTS 304 transmits the modified measurement list to mobile station 306.

Next, at Step 416, mobile station 306 measures signal strength levels on all channels in the measurement list and returns the results to BTS 304. The measurement results are then transferred to the measurement report splitter 314 and measurement list generator 316. Measurement report splitter 314 then transfers the results of the handoff measurement channel measurements to measurement evaluator 310 and the results of the other measurement channel measurements to the channel measurement collector 308. The process then moves to Step 418 where the measurement list generator 316 waits for a process input.

Next, at Step 420, a process input is received. The process input could be either an signal indicating that the call is over, an internal signal generated within the measurement list generator 316 indicating that the modified measurement list should be reconfigured in order to perform signal measurements or, an internal signal generated within mobile station 306 indicating that mobile station 306 should perform signal measurements and transmit the results to BTS 304.

After receiving a process input, the process moves to Step 421. At Step 421 a determination within mobile station 306 is made as to whether the signal indicates that mobile station 306 should perform signal measurements and transmit the results to BTS 304. If it is determined that mobile station 306 should perform signal measurements the process moves back to Step 416 where mobile station

306 measures signal strength levels on all channels in the measurement list and returns the results to BTS 304. If, however at Step 421, it is determined that the process input is not an internally generated signal indicating that mobile station 306 should performed measurements, the process moves to Step 422. At Step 422 a determination is made as to whether or not the call is over. If it is determined that the call is over, the process moves to Step 434 and ends. If, however, at Step 422, it is determined that the call is not over, the measurement list is to be modified to make new signal level measurements and, the process moves to Step 424. The list may be reconfigured for new measurements by either replacing handoff measurement channels in the list with other handoff measurement channels or, by replacing the other measurement channels in the list with other measurement channels. Handoff measurement channel changes and other measurement channel changes may be done simultaneously for the same list simultaneously or, for the handoff measurement channels or other measurement channels each separately while leaving the other channels unchanged. At Step 424 measurement list generator 316 makes a determination as to whether or not the measurement list reconfiguration involves a handoff measurement channel change. If it is determined that the measurement list reconfiguration involves a handoff measurement channel change, the process moves to Step 426. At Step 426 measurement list generator 316 reconfigures the handoff measurement channels in the list. The handoff measurement channels may be reconfigured by replacing handoff measurement channels singly or in numbers greater

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than one, with handoff measurement channels that were removed from the list at Step 410. The system operator may adjust the process as desired so that as calls proceed within the cell, signal level measurements are made on all of the N original channels that compiles the initial measurement list. The operator can then be assured that the significant changes in any of the signal strengths of the N original channels are not missed. From Step 426, the process then moves to Step 428. If however, at Step 424, it is determined that a handoff measurement channel change is not be made, the process moves to Step 428 without a handoff measurement channel change.

At Step 428 measurement list generator 316 determines whether the other measurement channels in the list are to be reconfigured. If it is determined that the other measurement channels in the list are to be reconfigured, the process moves to Step 430. At Step 430 the reconfiguration of the other measurement channels in the list is performed by replacing selected other measurement channels in the list with measurement channels from channel measurement database 308. If the number of other measurement channels to be measured is large, Step 430 may be performed more frequently than Step 426 as the process of FIG. 4 is performed. The replacement of the other measurement channels may be done singly or, in numbers greater than one, so that signal level measurements can be obtained for a desired set of other measurement channels of the system. From Step 430, the process then moves to Step 432. If, however, at Step 428, it is determined that the other measurement channels in the list

are not to be reconfigured, the process will move directly to Step 432.

At Step 432 measurement list generator 316 determines whether the measurement list has been modified at either Step 424 or Step 428. If it is determined that the measurement list has been modified, the process moves to Step 414. At Step 414 measurement list generator 316 transfers the modified measurement list to transmitter 320 and BTS 304 transmits the list to mobile station 306. The process steps of Step 416 through Step 432 are then repeated until the call ends. If, however, at Step 432 it is determined that the list is not modified, the process will move to Step 416. Step 416 through Step 432 are again then repeated. The process will continue until the call ends and then moves to Step 434. As the call continues, the process will repeat Steps 418 through 432 and then either Step 414 or Step 416. By changing the handoff measurement channels in the list at Step 426 and the other measurement channels in the list at Step 428, a desired set of signal level measurements on handoff measurement channels and other measurement channels may be obtained. The system operator may set the timing of Steps 426 and 428 so that a desired accuracy is achieved for both the handoff signal level measurements and the other signal level measurements.

While the embodiment of the invention has been described as implemented into the IS-136 system, it will be obvious to one skilled in the art that the invention has equal applicability to the IS-54B, GSM, PDC, or similar systems.

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The invention also is applicable to CDMA type systems, such as systems operating according to the IS-95 system standard, in which MAHO measurements are made on neighboring base stations using predefined pilot code sequences. Such systems may also have a neighbor cell list limited in size.

As can be seen from the above description, the measurement process and system of the invention allows a system operator to obtain signal level measurements on channels other than those handoff measurement channels on which signal level is measured for MAHO purposes utilizing the MAHO process. The results of the measurements on the additional channels may then be used as desired by the system operator. For example, the system operator may use the measurement results to create a new accurate neighbor cell list or, may use the measurement results in an adaptive channel allocation process.

It is believed that the operation and construction of the present invention will be apparent from the foregoing description and, while the invention shown and described herein has been characterized as particular embodiments, changes and modifications may be made therein without departing from the spirit and scope of the invention as defined in the following claims.

WHAT IS CLAIMED IS:

1. In a telecommunications system having a plurality of base stations and a plurality of mobile stations operating within the coverage areas of said plurality of base stations, wherein a selected mobile station of said plurality of mobile stations is capable of measuring signal levels on channels identified in a measurement list transmitted to said selected mobile station from a first base station and, said system is capable of handing off communications with said selected mobile station from said first base station to a second base station by utilizing measurements made on a plurality of handoff measurement channels, a method for measuring signal levels on channels of said system at said selected mobile station, said method comprising the steps of:

(a) placing a selected plurality of channel identifiers comprising N handoff measurement channel identifiers in the measurement list;

(b) transmitting the measurement list to the selected mobile station;

(c) measuring at the selected mobile station, a signal level on each of the channels identified in the measurement list, thereby obtaining a first set of measurement results;

(d) transmitting said first set of measurement results to the first base station;

(e) removing, responsive to said first set of measurement results, N-Y handoff measurement channel identifiers from the measurement list, thereby leaving Y handoff channel identifiers in the measurement list;

NSDOCID: <WO ... 9731502A1 | >

(f) adding X channel identifiers identifying X channels of a plurality of other channels to the measurement list;

(g) transmitting the measurement list to the selected mobile station;

(h) measuring, at the selected mobile station, a signal level on each of the channels identified in the measurement list thereby obtaining a second set of measurement results on said Y handoff measurement channels and a third set of measurement results on said X other channels; and

(i) transmitting said second and third set of measurement results to the first base station.

2. The method of claim 1, wherein X = N-Y.

3. The method of claim 1, wherein X < N-Y.

4. The method of claim 1, wherein X > N-Y.

5. The method of claim 1 further comprising the step of repeating steps (e) through (i), wherein the variable Y varies between repetitions of step (e).

6. The method of claim 1 wherein step (e) comprises removing N-Y handoff measurement channel identifiers of handoff measurement channels having the N-Y lowest signal strengths measured during step (d).

7. The method of claim 1 wherein said step (e) comprises removing N-Y handoff measurement channel identifiers of handoff measurement channels having a signal strength level less than a predetermined signal strength level.

8. The method of claim 1 wherein the communications between the selected mobile station and the first base station are carried out over a selected channel and said step (e) comprises removing N-Y handoff measurement channel identifiers having a signal strength level less than a predetermined signal strength level, wherein said predetermined signal strength level is defined relative to a signal level on said selected channel.

9. The method of claim 1, wherein each of said N handoff measurement channels is assigned a ranking penalty and where Step (e) comprises the steps of:

(e1) assigning, responsive to said first set of signal level measurements, a ranking value indicating an order of preference for handoff to each of said N handoff measurement channels, wherein a selected ranking value of a selected handoff measurement channel is a function of a signal strength level and a ranking penalty of said selected measurement channel; and

(e2) removing N-Y measurement channel identifiers of handoff measurement channels, having the N-Y lowest ranking value assigned in Step (e1), from the measurement list.

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10. The method of claim 1, further comprising the steps of:

(j) substituting at least one of said N-Y handoff measurement channel identifiers removed from the list during step (e) for at least one of said Y handoff measurement channel identifiers in the measurement list; and

(k) repeating steps (g),(h), (i) and (j) for a predetermined number of iterations.

11. The method of claim 10 in which said N handoff measurement channel identifiers placed in the measurement list in the first iteration of step (a) comprise original channel measurement identifiers, and, in which said method further comprises the steps of:

(l) repeating steps (a) through (k) wherein said N handoff measurement channel identifiers in subsequent iterations of step (a) comprise said original measurement channel identifiers.

12. The method of claim 1 wherein further comprising the steps of:

(j) substituting at least one other channel identifier of said second plurality of channels for at least one of said N-Y channel identifiers added to the measurement list during step (f); and

(k) repeating steps (g),(h), (i) and (j) for a predetermined number of iterations.

13. The method of claim 12 in which said N handoff measurement channel identifiers placed in the measurement

list in the first iteration of step (a) comprise original channel measurement identifiers, and, in which said method further comprises the steps of:

(l) repeating steps (a) through (k) wherein said N handoff measurement channel identifiers in subsequent iterations of step (a) comprise said original measurement channel identifiers.

14. In a telecommunications system having a plurality of base stations and a plurality of mobile stations operating within the coverage areas of said plurality of base stations, wherein a selected mobile station of said plurality of mobile stations is capable of measuring signal levels on channels identified in a measurement list of channels transmitted to said selected mobile station from a first base station and, said system is capable of handing off communications with said selected mobile station from said first base station to a second base station by utilizing measurements made on a plurality of handoff measurement channels, an apparatus for measuring signal levels on channels of said system at a selected mobile station, said apparatus comprising:

a measurement report splitter for receiving at least one measurement report comprising results of signal level measurements performed at the selected mobile station on at least one handoff measurement channel identified in a first measurement list wherein said measurement report splitter generates a first signal comprising results of said first measurement report;

NSDOCID: <WO 9731502A1_I_>

a first memory device for storing a neighbor cell list database;

a measurement list generator, coupled to said first memory device, said measurement list generator for receiving said first signal, accessing said neighbor cell list data base and, generating a second measurement list comprising Y handoff measurement channel identifiers and X other measurement channel identifiers.

15. The apparatus of claim 14, wherein X = N-Y.

16. The apparatus of claim 14, wherein X < N-Y.

17. The apparatus of claim 14, wherein X> N-Y.

18. The apparatus of claim 14, further comprising:

a transmitter, coupled to said measurement list generator, said transmitter for transmitting said second measurement list to a selected mobile station; and

a receiver, coupled to said measurement report splitter, said receiver for receiving results of signal level measurements from said selected mobile station and transferring said results to said measurement report splitter.

19. The apparatus of claim 14, wherein, further, said measurement report splitter receives a second measurement report comprising results of signal level measurements made on said second measurement list

generated in said measurement list generator and generates, responsive to receiving said second measurement list, a second and third signal, wherein said second signal comprises results of signal level measurements made on said Y handoff measurement channels and said third signal comprises results of signal level measurement made on said X other measurement channels.

20. The apparatus of claim 19 wherein said apparatus further comprises:

a channel measurement collector, coupled to said measurement report splitter, said channel measurement collector for receiving said third signal; and

a handoff measurement evaluator, coupled to said measurement report splitter, said handoff measurement evaluator for receiving said second signal and evaluating said Y handoff measurement channels for handoff.

21. The apparatus of claim 19 wherein said Y handoff measurement channels comprise handoff measurement channels having the highest signal level measurements in said first measurement report.

22. The apparatus of claim 19 wherein said Y handoff measurement channels comprise handoff measurement channels having signal level measurements of said first measurement report above a predetermined level.

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23. The apparatus of claim 22 wherein communications between the selected mobile station and the first base station are carried out over a selected channel and wherein said predetermined level is defined relative to a signal level on said selected channel.

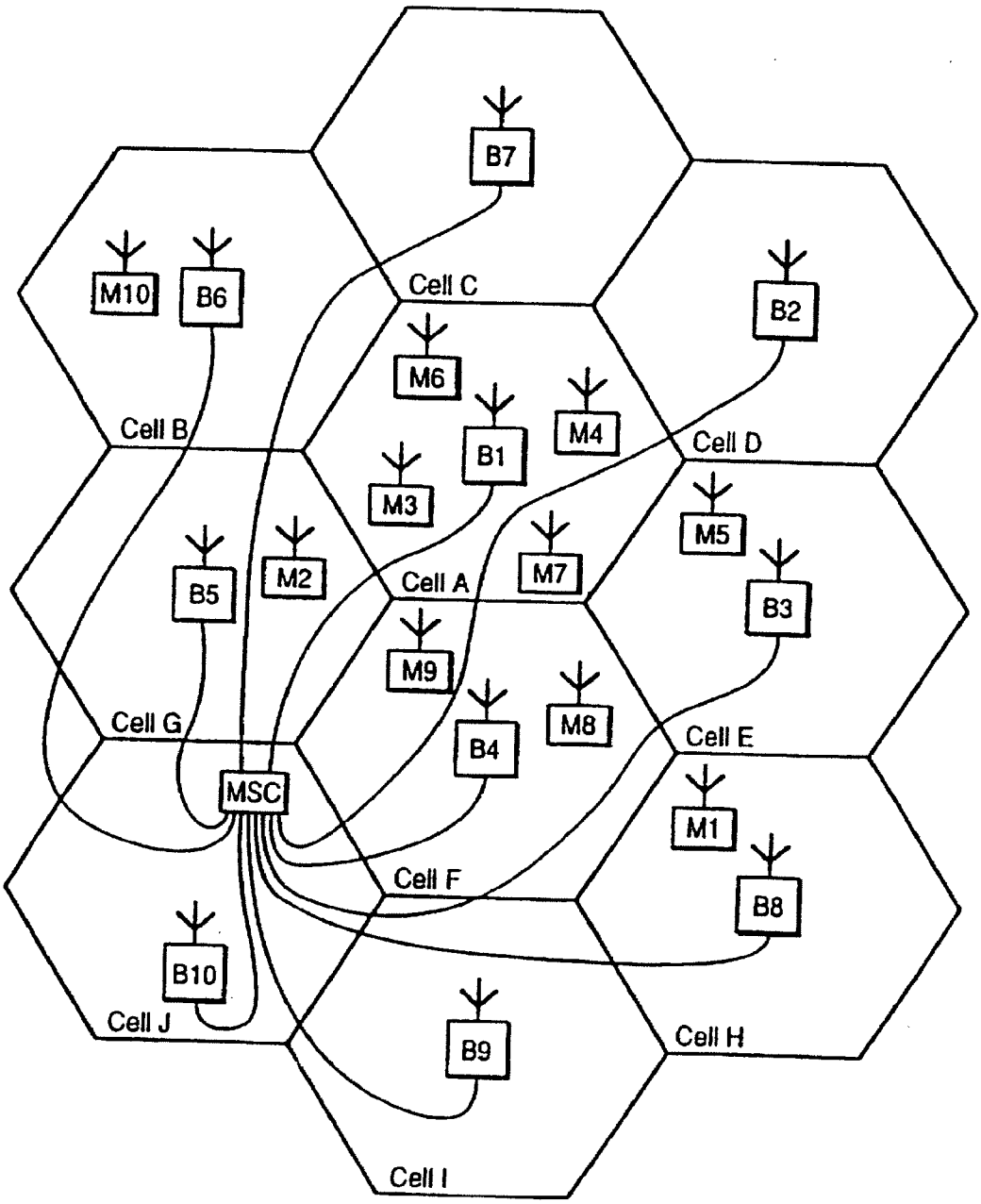


Fig.1

NSDOCID: <WO_____ 9731502A1 | >

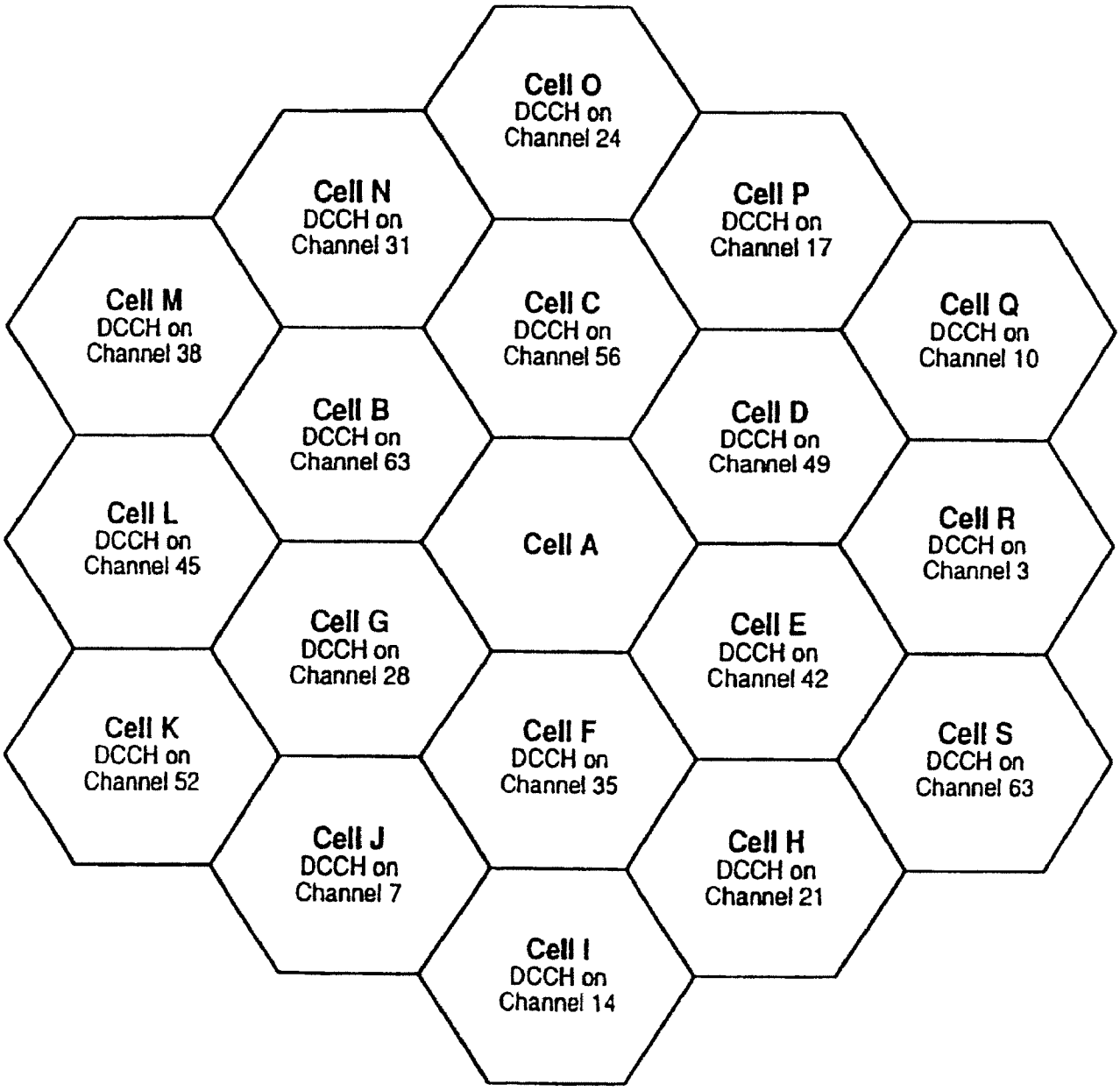
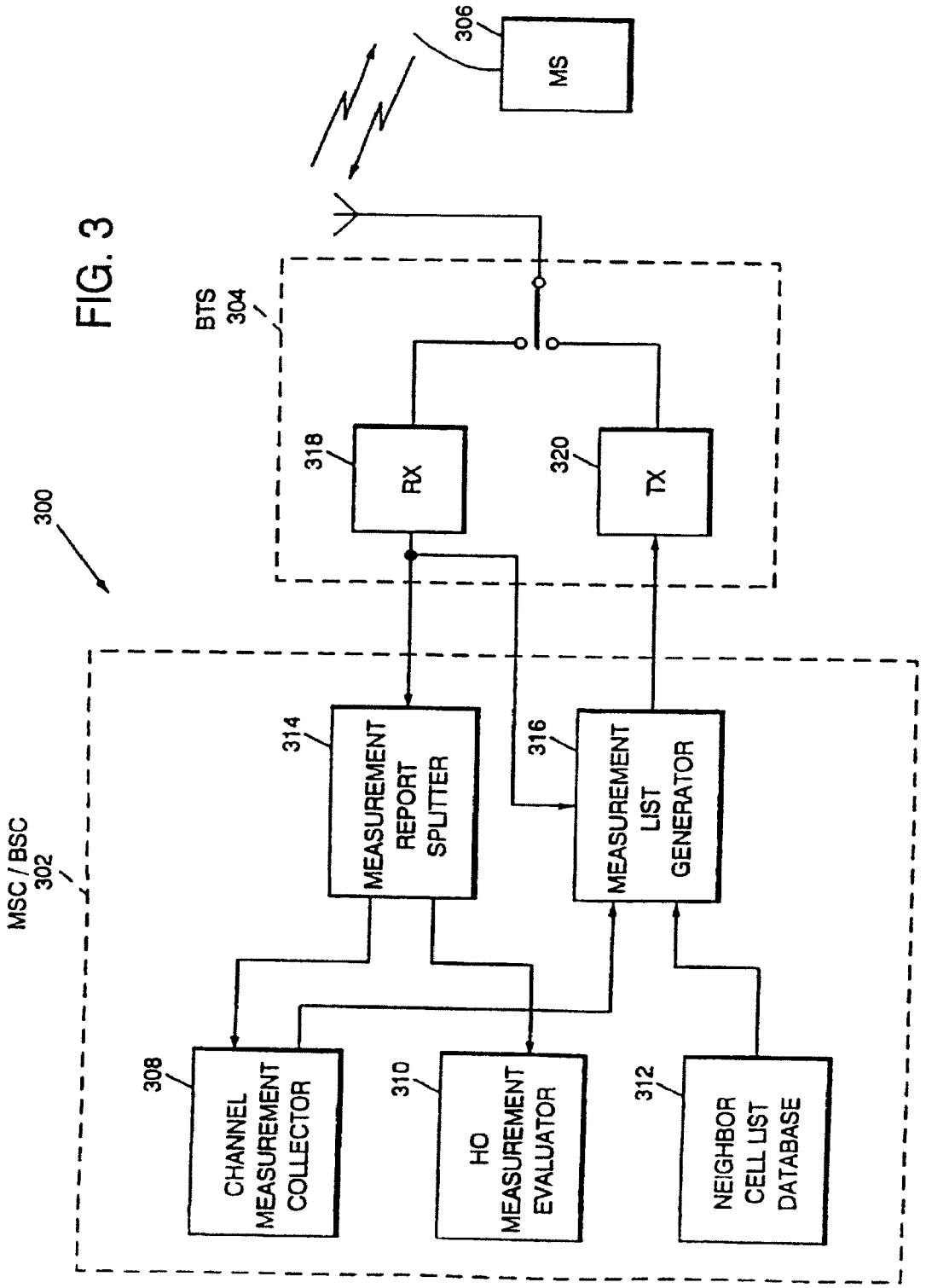

Cell O
DCCH on
Channel 24
Cell N
DCCH on
Channel 31
Cell P
DCCH on
Channel 17
Cell M
DCCH on
Channel 38
Cell C
DCCH on
Channel 56
Cell Q
DCCH on
Channel 10
Cell B
DCCH on
Channel 63
Cell D
DCCH on
Channel 49
Cell L
DCCH on
Channel 45
Cell A
Cell R
DCCH on
Channel 3
Cell G
DCCH on
Channel 28
Cell E
DCCH on
Channel 42
Cell K
DCCH on
Channel 52
Cell F
DCCH on
Channel 35
Cell S
DCCH on
Channel 63
Cell J
DCCH on
Channel 7
Cell H
DCCH on
Channel 21
Cell I
DCCH on
Channel 14

Fig.2

FIG. 3



INSDOCID: <WO 9731502A1 | >

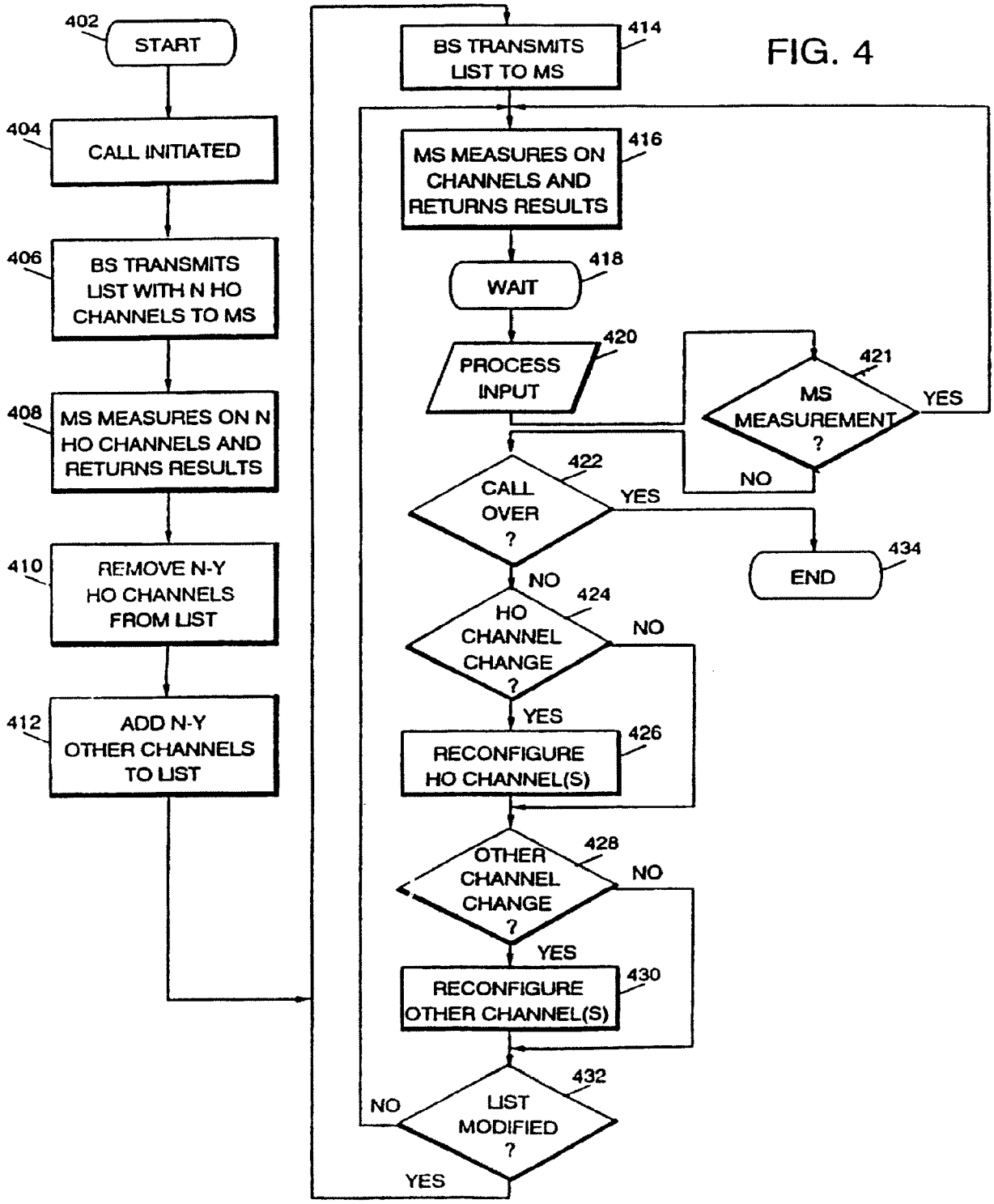

402
START
404
CALL INITIATED
406
BS TRANSMITS LIST WITH N HO CHANNELS TO MS
408
MS MEASURES ON N HO CHANNELS AND RETURNS RESULTS
410
REMOVE N-Y HO CHANNELS FROM LIST
412
ADD N-Y OTHER CHANNELS TO LIST
414
BS TRANSMITS LIST TO MS
416
MS MEASURES ON CHANNELS AND RETURNS RESULTS
418
WAIT
420
PROCESS INPUT
421
MS MEASUREMENT ?
YES
NO
422
CALL OVER ?
YES
NO
434
END
424
HO CHANNEL CHANGE ?
NO
YES
426
RECONFIGURE HO CHANNEL(S)
428
OTHER CHANNEL CHANGE ?
NO
YES
430
RECONFIGURE OTHER CHANNEL(S)
432
LIST MODIFIED ?
NO
YES

FIG. 4

INTERNATIONAL SEARCH REPORT

Interr al Application No
PCT/SE 97/00266

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 428 816 A (BARNETT CHARLES A ET AL) 27 June 1995 see column 2, line 19 - line 30 see column 4, line 31 - line 42 see column 5, line 3 - line 11 see column 5, line 51 - column 6, line 3 see column 7, line 46 - column 9, line 37	1-7, 14-19
A	US 5 483 669 A (BARNETT CHARLES A ET AL) 9 January 1996 see column 3, line 55 - column 4, line 22 see column 5, line 13 - line 24 see column 6, line 53 - column 10, line 23	1,14
A	US 5 475 868 A (DUQUE-ANTON JESUS M ET AL) 12 December 1995 see column 2, line 43 - line 67 see column 7, line 22 - line 37; claim 1	1,14

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 June 1997	27. 06. 97
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	Authorized officer Gerling, J.C.J.

Form PCT/ISA/210 (second sheet) (July 1992)

NSDOCID: <WO_____9731502A1_I_>

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern al Application No
PCT/SE 97/00266

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5428816 A	27-06-95	NONE	
US 5483669 A	09-01-96	NONE	
US 5475868 A	12-12-95	DE 4225688 A	10-02-94
		DE 4303999 A	18-08-94
		AU 670955 B	08-08-96
		AU 4433993 A	17-02-94
		CN 1086363 A	04-05-94
		EP 0585994 A	09-03-94
		JP 7007764 A	10-01-95

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(54) Telecommunication system and method

(57) A method for a user equipment to transmit a set of data to at least a first telecommunication network, said user equipment comprising a rechargeable power supply, said method comprising the acts of acquiring network related information from at least a second telecommunication network by the user equipment and initiating the transmission of a set of data to the at least first telecommunication network upon detection of the charging of the power supply, the set of data comprising said network related information.

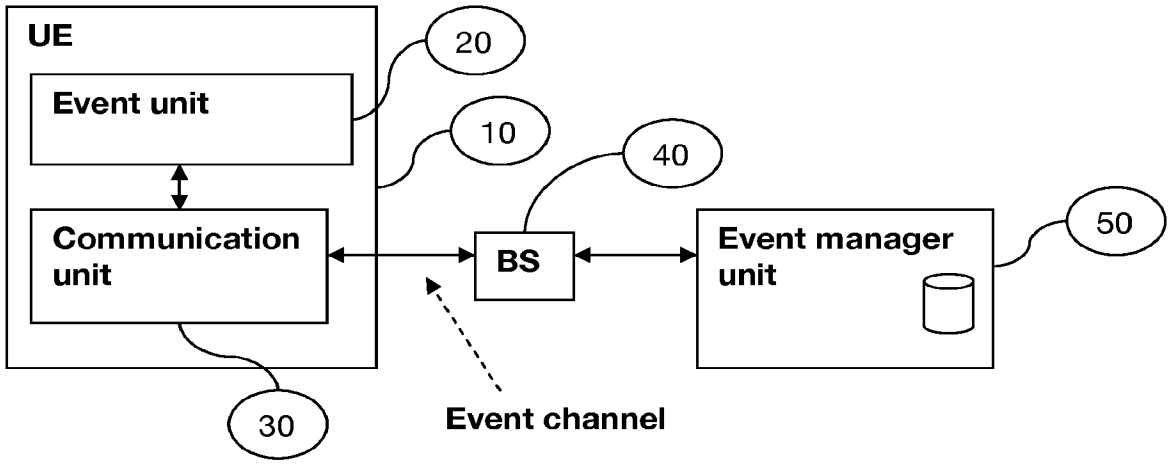


Figure 1

EP 2 076 093 A1

Description

Field of the Invention

[0001] The present invention relates in general to telecommunication networks and systems, more specifically telecommunication networks and systems enabled for collecting network coverage information.

Background of the Invention

[0002] Telecommunication networks provide a facility for communicating to and from a user equipment (UE) using mobile devices that comprises a rechargeable power supply.

[0003] For the deployment and the maintenance of a telecommunication network, coverage deployment software and field radio measurement of the coverage are very important, especially for areas with insufficient network coverage or high densification of UEs.

[0004] The past and current network deployments (2G and 3G) show that handling efficiently indoor coverage is a key to insure a good quality of service for the subscribers of telecommunication networks. Communication from indoor environments is very important in terms of usage for said subscribers, but, due to access rights for buildings, the telecommunication network operators have very limited means to measure indoor coverage within said buildings.

[0005] Previous patent documents such as KR20010050257 and US2006183487 rely on network level information in known geographical location to detect zones with insufficient coverage to take measures to improve the quality of service. However, even though Location Based Services (LBS) based on Global Positioning System (GPS) are widely spread, these methods are not suitable for the detection of indoor coverage problems, where satellite signal cannot be properly acquired. Moreover, those systems require measurement, calculations and information processing that all consume a large amount of the user equipment capabilities.

[0006] Today there is a need for an information collection solution that can be easily implemented on the existing and future telecommunication infrastructures.

Summary of Invention

[0007] It is an object of the present system to overcome disadvantages and/or make improvement over the prior art.

[0008] To that extend, the invention proposes a telecommunication method according to claim 1.

[0009] Mobile user equipments have a battery with an autonomy that depends on the usage. The battery needs to be charged regularly for the user equipment to work properly. The present system and method relies upon the applicant's observation that charging is commonly performed by many users at home, at work, or in the car thanks to a dedicated cradle. In the two first situations, the user equipments are most likely to be inside a building and with mobility restricted by the length of the power cord. In other words, in many cases the fact that the user equipment is in charging status is an implicit indication that the user equipment is in indoor situation, but still at a location where the user still wants to be reached.

[0010] The method according to one embodiment of the present invention describes the estimation of indoor coverage and the detection and identification of potential network coverage problems, based on detection on the user equipment power charging events reported to the network for analysis.

[0011] The main advantages are the following:

- Relying on an action all users perform (battery charging) on a very regular basis (from several times a week if not daily)
- Cost effectiveness compared to field measurement campaign
- Non intrusive acquisition of information.

[0012] The invention relates to a method for acquiring, sending and processing network-related information to further modify network parameters when required according to claims 1 to 13.

[0013] The invention also relates to a system for acquiring, sending and processing network-related information to further modify network parameters when required according to claims 14 to 18.

[0014] The invention also relates to a user equipment for acquiring and sending network-related information according to claims 19 to 22.

[0015] The invention also relates to a computer program for acquiring and sending network-related information according to claim 23.

Brief Description of the Drawings

[0016] Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings, where like parts are provided with corresponding reference numerals, and in which:

Figure 1 schematically illustrates a system according to an embodiment of the present invention;

Figure 2 schematically illustrates the information fields, or parameters, of a message exchanged between a user equipment and a telecommunication network according to an embodiment of the present invention;

Figure 3 schematically illustrates the method carried out by a user equipment according to an embodiment of the present invention;

Figure 4 schematically illustrates the method carried out in the telecommunication network according to an embodiment of the present invention.

Description of Preferred Embodiments

[0017] Telecommunication networks allow mobile user equipments (UEs) to communicate. Mobile UEs have a power supply, or battery, with an autonomy that depends on the usage and that needs charging. The battery needs to be charged regularly for the user equipment to work properly. Charging is commonly performed by many users at home, at work, or in their car thanks to a dedicated cradle. In the first two situations, the user equipments are most likely to be inside a building and with mobility restricted by the length of the power cord. In other words, in many cases the fact that the user equipment is in charging mode is an implicit indication that the user equipment is in indoor situation, but still at a location where the user still wants to be reached.

[0018] According to an embodiment of the present invention, a method is provided for and comprises the acts of:

- Acquiring the status of the user equipment, said status being connected/disconnected to a source of energy;
- Storing this status, along with other information such as cell ID, Bit Error Rate (BER) or Frame Error Rate (FER) or any relevant wireless indicator;
- Communicating those data using messages called event messages hereafter, in real time or with delay (e.g. depending on communication conditions or if the UE is busy doing something else (e.g. with another application...)), to the telecommunication network e.g. through a Base Station (BS);
- Collecting and storing those data in a database in the network e.g. to make a cartography of the network radio coverage;
- Analysing those data, which gives indicators of network coverage in indoor situations, possibly correlating them with external information such as e.g. the address of the user, in order to further improve the network radio coverage.

[0019] In order to communicate the data in real time or with delay, the act of initiating the transmission of the (set of) data is followed by an act of transmitting said set of data upon detection of a triggering event, where the triggering event may be at least one of:

- a sufficient network of the at least first telecommunication network availability allowing data transmission;
- the availability of the user equipment;
- a request received from the at least first telecommunication network;
- a delay from the detection of the charging of the power supply;
- the charging of the power supply.

[0020] The method according to the invention is further down illustrated for the same network in which the UE collects from and sends to the network related information, but the case where network related information is collected from one or several telecommunication network (s) and sent to one or several telecommunication network (s) (not necessarily the same) are also within the scope of the present invention.

[0021] According to one exemplary embodiment of the present invention, several sub-systems, or system units, and their related data and messages are further described by way of example.

[0022] Figure 1 describes a system according to the present invention wherein a User Equipment (UE) 10 comprises an event unit 20 and a communication unit 30. Said UE 10 communicates through the Base Station (BS) 40 with an event manager unit 50 located in the telecommunication network.

[0023] The event unit 20 is in charge of acquiring the battery charging event and of adding additional information regarding the current environment (network coverage parameters, location etc...). The event sub-system acquires the information of the user equipment being connected to an energy source, for instance an electric plug, to charge its battery. The event sub-system is capable of storing events that have been acquired by the user equipment.

[0024] The communication unit 30 is a subsystem in charge of handling the wireless communication. It has knowledge of the signal conditions and, in particular, of the strength of the signal associated with the coverage of the location of the user equipment. Thus, when a user equipment is plugged for charging its battery, the signal strength (or any relevant parameter for the estimation of the quality of the network coverage) is measured and integrated into an event message that will further be sent to the event manager subsystem 50 of the telecommunication network. Said message may be structured into a frame. The communication unit 30 interacts with the BS 40 of the telecommunication network. The communication to the BS can be ensured over a Media Access Control (MAC) layer event channel, with proper scheduling and prioritization of event information delivery.

[0025] In a possible implementation a frame of the message to be transferred over the event channel may be as follows:

- MAC header which is added to turn the message into a frame ready for transmission over the network;
- Event attributes which comprises event-related information (e.g. battery charging, charging time, location etc...
- Optional attributes (e.g. service information ...)
- Checksum for allowing error detection in the transmitted bits of information.

[0026] The Base Station 40 collects and transfers the event message to the event manager unit 50.

[0027] This event manager unit 50 receives event mes-

sages from the BS. This unit allows:

- Real time management
- Event information storing
- Analysis on collected information.

[0028] The event manager unit 50 may be further connected to statistics and reports tools (e.g. statistics and reports servers).

[0029] The message or data transfer between the mobile user equipment and the event manager sub-system may be performed over a Power Line Communication (PLC) or a physical or wireless connection to another device such as a Set Top Box that acts as the BS in the embodiment described above.

Examples of application of the invention may be the measurement of indoor coverage such as:

[0030]

- the distribution of indoor coverage in the cells of a cellular access network

- the finer analysis if correlated with time and user information

This information provides evidence to assist the operational decision of network densification and/or management.

[0031] Figure 2 describes the information structure of an event message generated by the event sub-system.

[0032] A header parameter may give a description of the event, a event type field or parameter may give the type of the event, an event data parameter may give the charging duration. A priority parameter may give the priority level with which the event should be handled. A field may be reserved for the information on the signal conditions such as the signal strength, the bandwidth for an application or any parameter relevant of the network coverage of the user equipment at the time the battery is charging. Signal characteristics of multiple networks may also be given in the case of multimode user equipments (ex. 4G + WLAN or 4G + DVB-H or ISDBT etc...).

[0033] A network data field may give information about the Base Station the user equipment is connected to like e.g. the cell ID etc... A user data field may give information on the user (e.g. profile, ID etc...). A time stamp parameter may give the time the event (e.g. battery charging start/stop) was triggered. A service data field may give information about service ID that has issued the location information. A location information field may comprise location information such as e.g. coordinates or ID for discrete point location, precision level speed etc...

[0034] Figure 3 describes the method on the user equipment according to one embodiment of the invention and wherein:

- the charging of the power supply of the user equipment is detected in an act 310;
- in an optional act 315, event acquisition such as e.g. key pressing, phone opeing/closing, bar code or RFID scanning may also be detected
- the network related information previously described in Figure 1 and 2 is acquired in an act 320;
- location information of the user equipment may be acquired in an option act 340;
- the event message comprising network related information and optionally location is sent to the telecommunication network in an act 330.
- QUESTION: could it be possible to create an act "315" that would perform event acquisition, power supply detection being one particular case?

[0035] Figure 4 describes the method in the telecommunication network according one embodiment of the invention and wherein:

- the event message described in Figure 3 is received by the telecommunication network in an act 410;
- in an optional act 415, network-related information comprised in the event message may be stored by the telecommunication network;
- network parameters may be modified in an additional act 420 according to the received data (comprised in the event message) that comprise network related information and optionally location of the UE;
- the telecommunication network coverage is further optimized (coverage, quality of signal, quality of service etc...) using the received data in an act 430.

[0036] Acts 420 and 430 are optional as they may depend upon the network operator policy for using network related information and taking corrective measures when identifying a region with limited coverage.

[0037] A user equipment may collect or acquire network related information from a plurality of networks. In an exemplary embodiment of the invention, a user equipment may collect network related information from a 3G telecommunication network (e.g. Universal Mobile Telecommunication System (UMTS)), a Wifi network and a Wimax network upon detection of the charging of the battery and send this information to the sole 3G UMTS network. This multimode dimension may be illustrated for example for using the sufficient connectivity on one network to improve the coverage of another network - broadcast being a good example.

[0038] When the network related information from at least one of a second network is collected, it may be further sent to at least one of a first telecommunication network(s) the UE may be connected to, or will be connected to, either directly or upon a triggering event e.g. later on or on request from at least one of said first network(s). "Directly" means in real time or straight upon detection of the charging event and upon collection of network related information. "Later on" means the net-

work related information may be stored then send later. "On request" means that a request from at least one of a first network sends a request to the user equipment for the UE to send it the network collected information (e.g. once a month or else...) or event message.

[0039] Besides, the act of acquiring or collecting the network related information may be uncorrelated with the detection in the sense that it may be done e.g. periodically or before the event of charging detection.

[0040] Operations carried out by the UE and the telecommunication network may be both executed by a computer program.

[0041] The use of the connection to a power source as a location indicator is one example of event. Handling other types of events would be possible:

- RFID scanning
- 2D bar code
- GPS based Location events
- Zigbee (low power consumption UWB for indoor location)
- Short range data transmission (such as Bluetooth and IR). Transferring data between PC and mobile phone can give information on the location (about 30cm far from the PC)

[0042] In the case of GPS based location event, a service tag specific to the services that has triggered the request for location can be integrated in the event structure.

[0043] Especially, the management of RFID or 2D bar codes provides a way to manage location events defined as discrete point.

Claims

1. A method for a user equipment (10) to transmit a set of data to at least a first telecommunication network (40, 50), said user equipment (10) comprising a rechargeable power supply, said method comprising the acts of:

   - acquiring network related information from at least a second telecommunication network by the user equipment (10);
   - initiating the transmission of a set of data to the at least first telecommunication network (40, 50) upon detection of the charging of the power supply, the set of data comprising said network related information.

2. A method according to claim 1, wherein the acquiring of network related information is triggered upon detection of the charging of the power supply.

3. A method according to one of the previous claims, wherein the network related information comprises the signal strength of the at least second telecommunication network (40, 50) measured by the user equipment (10).

4. A method according to one of the previous claims, wherein said user equipment (10) is further operable to acquire its location and wherein the network related information comprises the location acquired by the user equipment (10).

5. A method according to one of the previous claims, wherein the act of initiating the transmission of the set of data is followed by an act of transmitting said set of data upon detection of a triggering event, said triggering event being at least one of:

   - a sufficient network of the at least first telecommunication network availability allowing data transmission;
   - the availability of the user equipment;
   - a request received from the at least first telecommunication network;
   - a delay from the detection of the charging of the power supply;
   - the charging of the power supply.

6. A method according to one of the preceding claims, wherein the set of data comprises an indication of the charging of the power supply of the user equipment (10).

7. A method according to one of the preceding claims, wherein the first and second telecommunication networks are identical.

8. A method in a first telecommunication network (40, 50) to receive from a user equipment (10) of said first telecommunication network (40, 50) network related information from at least a second telecommunication network, said user equipment (10) comprising a rechargeable power supply, said method comprising the acts of:

   - receiving a set of data from the user equipment (10), said set of data comprising:

     - network related information acquired by the user equipment (10) prior to sending the set of data;
     - an indication on the charging of the power supply, said charging having initiated the sending of said set of data by the user equipment (10).

9. A method according to claim 8, wherein the network related information comprises the signal strength of the at least second telecommunication network (40, 50) measured by the user equipment (10).

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10. A method according to any of the preceding claims 8 and 9, wherein said user equipment (10) is further operable to acquire its location and wherein the network related information comprises the location acquired by the user equipment (10).

11. A method according to any of the preceding claims 8 to 10, further comprising the act of modifying the first telecommunication network parameters according to the received network related information.

12. A method according to any of the preceding claims 8 to 11, further comprising the act of optimizing the first telecommunication network (40, 50) coverage using the network related information.

13. A method according to any of the preceding claims 8 to 12, further comprising a preliminary act of requesting network related parameters.

14. A telecommunication system comprising a user equipment (10) operable to transmit a set of data to an event manager (50) in a first telecommunication network (40, 50), said user equipment comprising a rechargeable power supply, said user equipment (10) being operable to:

- acquire network related information from at least a second telecommunication network by the user equipment (10);
- initiate the transmission of a set of data to the at least first telecommunication network (40, 50) upon detection of the charging of the power supply, the set of data comprising said network related information;

said event manager (50) being operable to receive the set of data from the user equipment (10).

15. A telecommunication system according to claim 14, wherein the network related information comprises the signal strength of the at least second telecommunication network (40, 50) measured by the user equipment (10).

16. A telecommunication system according to any of the preceding claims 14 and 15, wherein the network related information comprises an indication on the charging of the power supply, said charging having initiated the sending of said set of data by the user equipment (10).

17. A telecommunication system according to any of the preceding claims 14 to 16, wherein said user equipment (10) is further operable to acquire its location and wherein the network related information comprises the location acquired by the user equipment (10).

18. A telecommunication system according to any of the preceding claims 14 to 17, said system being further operable to optimize the first telecommunication network (40, 50) coverage using the network related information.

19. A user equipment to transmit a set of data to a first telecommunication network (40, 50), said user equipment (10) comprising a rechargeable power supply, said user equipment (10) being operable to:

- acquire network related information from at least a second telecommunication network by the user equipment (10);
- initiate the transmission of a set of data to the at least first telecommunication network (40, 50) upon detection of the charging of the power supply, the set of data comprising said network related information.

20. A user equipment according to claim 19, wherein the network related information comprises the signal strength of the telecommunication network (40, 50) measured by the user equipment (10).

21. A user equipment according to any of the claims 19 and 20, wherein said user equipment (10) is further operable to acquire its location and wherein the network related information comprises the location acquired by the user equipment (10).

22. A user equipment according to any of the preceding claims 19 to 21, wherein the set of data comprises an indication of the charging of the power supply of the user equipment (10).

23. A computer program providing computer executable instructions stored on a computer readable medium, which when loaded on to a data processor causes the data processor to perform a method for a user equipment (10) to transmit a set of data to at least a first telecommunication network (40, 50) according to one of the claims 1 to 7.

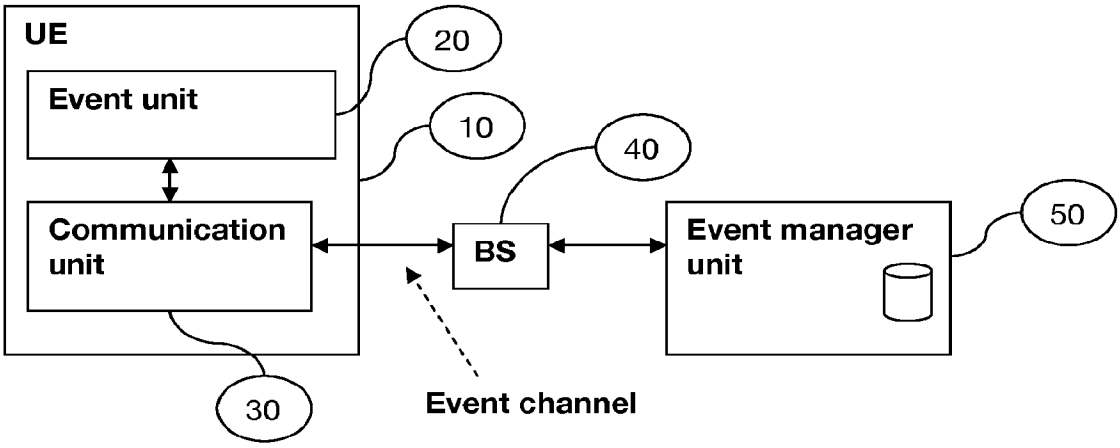


Figure 1

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Field	Comment
Header	Header describing the event
Event type	Type of the event (ex. battery charging)
Event data	Charging duration
Priority	Priority level with which the event should be handled
Signal	Contains information about the signal received by the user equipment
Network data	Information about the BS, e.g. cell ID
User data	Optional, User related information, ID, profile
Time stamp	Time the event was triggered
Service data	The service ID that has issued the location information
Event data	Location information (e.g. coordinates or ID for discrete point location). It may also contain precision level. Speed may be included as well

Figure 2

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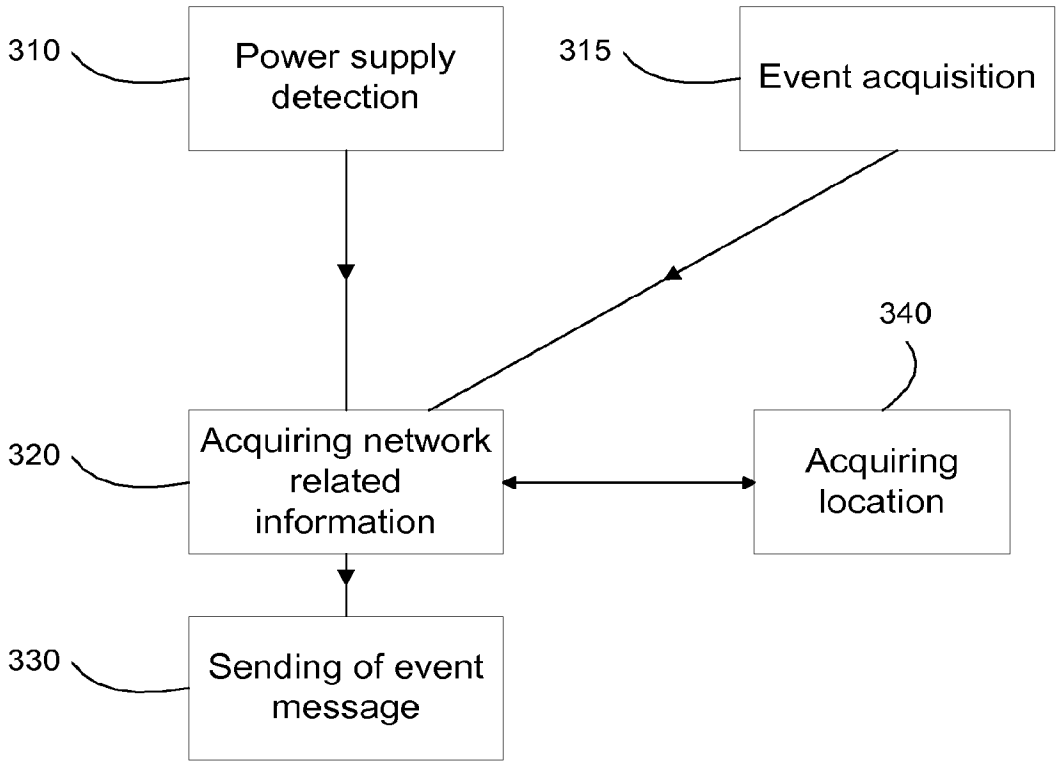


Figure 3

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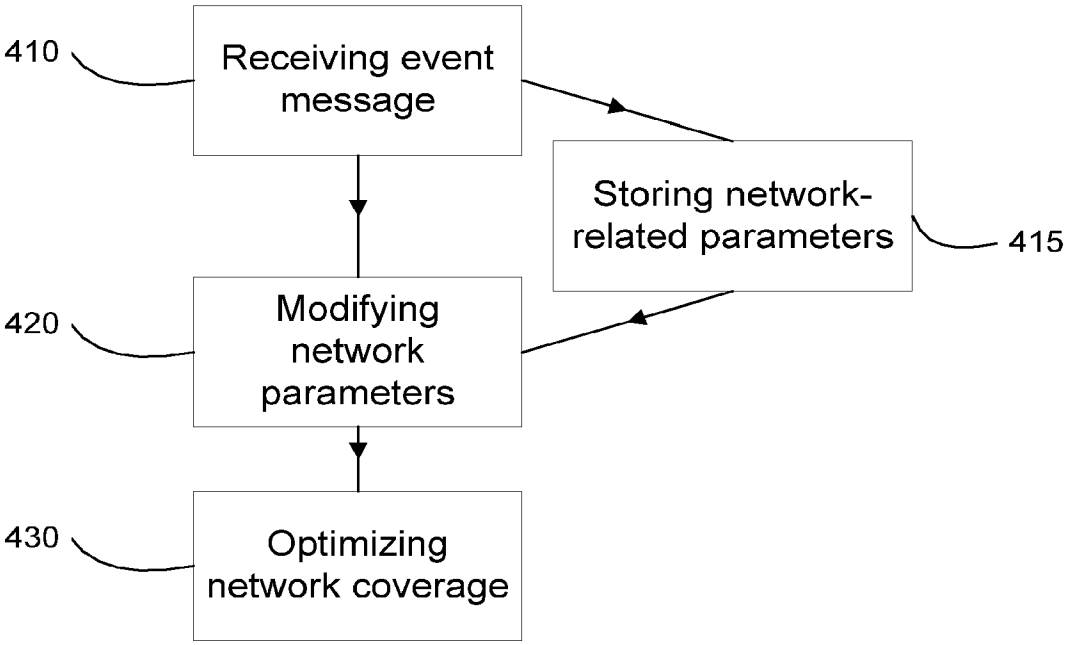


Figure 4

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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 30 5004

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2004/002328 A1 (CHANDRA ARTY [US] ET AL) 1 January 2004 (2004-01-01) * paragraph [0005] - paragraph [0009] * * paragraph [0012] * -----	1-23	INV. H04Q7/34
A	US 6 046 698 A (PANDEY CHANDRA SHEKHAR [US]) 4 April 2000 (2000-04-04) * column 1, line 51 - line 61 * * column 2, line 41 - line 49 * * column 3, line 6 - line 9 * * column 5, line 26 - line 34 * -----	1-23	
A	EP 0 740 482 A (HEWLETT PACKARD CO [US]) 30 October 1996 (1996-10-30) * column 1, line 50 - column 2, line 49 * * column 3, line 41 - line 55 * * column 5, line 1 - column 6, line 13 * -----	1-23	
			TECHNICAL FIELDS SEARCHED (IPC)
			H04Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Berlin	28 May 2008	Rothlübbers, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

1

Samsung Ex. 1002, Page 282 of 356

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 30 5004

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

28-05-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004002328 A1	01-01-2004	AU 2003253674 A1	19-01-2004
		CA 2490938 A1	08-01-2004
		CN 1666538 A	07-09-2005
		EP 1540971 A1	15-06-2005
		JP 2005531982 T	20-10-2005
		KR 20050096196 A	05-10-2005
		MX PA05000074 A	11-04-2005
		TW 269595 B	21-12-2006
		WO 2004004376 A1	08-01-2004
		US 2004192327 A1	30-09-2004
US 6046698 A	04-04-2000	NONE	
EP 0740482 A	30-10-1996	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

Samsung Ex. 1002, Page 283 of 356

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- KR 20010050257 **[0005]**
- US 2006183487 A **[0005]**

Samsung Ex. 1002, Page 284 of 356

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
Wuyts, Koenraad
KONINKLIJKE KPN N.V.
P.O. Box 95321
2509 CH The Hague
PAYS-BAS

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 403448WO	Date of mailing *(day/month/year)* 13 May 2011 (13-05-2011)
International application No. PCT/EP2010/069908	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
Applicant KONINKLIJKE KPN N.V.	International filing date *(day/month/year)* 16 December 2010 (16-12-2010)

1. [X] The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

   Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Fascimile No.: (41-22) 338.82.70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   [ ] the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

   [ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. Following the expiration of 30 months from the priority date, these comments will also be made available to the public.

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Name and mailing address of the International Searching Authority European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	Authorized officer ROTHENBüCHER, Anita Tel: +31 (0)70 340-9872

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
403448WO		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/EP2010/069908	16/12/2010	21/12/2009
Applicant		
KONINKLIJKE KPN N.V.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language,** the international search was carried out on the basis of:
      [X] the international application in the language in which it was filed
      [ ] a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. [ ] This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. [ ] With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. [ ] **Certain claims were found unsearchable** (See Box No. II)

3. [ ] **Unity of invention is lacking** (see Box No III)

4. With regard to the **title,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings,**
   a. the figure of the **drawings** to be published with the abstract is Figure No. 1
      [ ] as suggested by the applicant
      [ ] as selected by this Authority, because the applicant failed to suggest a figure
      [X] as selected by this Authority, because this figure better characterizes the invention
   b. [ ] none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/069908

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W24/08
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2004/002328 A1 (CHANDRA ARTY [US] ET AL) 1 January 2004 (2004-01-01) paragraph [0003] - paragraph [0004] paragraph [0008] - paragraph [0012]; claim 21	1-15
Y	WO 97/31502 A1 (ERICSSON TELEFON AB L M [SE]) 28 August 1997 (1997-08-28) claim 1	1-15

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
3 May 2011	13/05/2011

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Brichau, Gert

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2010/069908

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004002328 A1	01-01-2004	AU 2003253674 A1	19-01-2004
		CA 2490938 A1	08-01-2004
		CN 1666538 A	07-09-2005
		EP 1540971 A1	15-06-2005
		JP 4213665 B2	21-01-2009
		JP 2005531982 T	20-10-2005
		KR 20050096196 A	05-10-2005
		MX PA05000074 A	11-04-2005
		TW I269595 B	21-12-2006
		WO 2004004376 A1	08-01-2004
		US 2004192327 A1	30-09-2004
WO 9731502 A1	28-08-1997	AU 2237897 A	10-09-1997
		BR 9707619 A	27-07-1999
		CN 1216207 A	05-05-1999
		DE 69738102 T2	29-05-2008
		EP 0882380 A1	09-12-1998
		JP 2000510661 T	15-08-2000
		US 5722073 A	24-02-1998

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2010/069908	16.12.2010	21.12.2009

International Patent Classification (IPC) or both national classification and IPC
INV. H04W24/08

Applicant
KONINKLIJKE KPN N.V.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:

European Patent Office
P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk - Pays Bas
Tel. +31 70 340 - 2040
Fax: +31 70 340 - 3016

Date of completion of this opinion

see form PCT/ISA/210

Authorized Officer

Brichau, Gert

Telephone No. +31 70 340-1051

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:

   a. (means)

      ☐ on paper

      ☐ in electronic form

   b. (time)

      ☐ in the international application as filed

      ☐ together with the international application in electronic form

      ☐ subsequently to this Authority for the purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-15
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-15
Industrial applicability (IA)	Yes:	Claims	1-15
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:
- D1: US2004/0002328 (Arty Chandra et al.) 1 January 2004
- D2: WO97/31502 (Wallstedt et al.) 28 August 1997

2 The present application does not meet the criteria of Article 33(3) PCT, because the subject-matter of claim 1 does not involve an inventive step.

D1 is regarded as being the prior art closest to the subject-matter of claim 1, and discloses:

An automatic coverage assessment system configured for generating a coverage assessment for a second wireless access network of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network, the first and second wireless access networks being capable of providing services to a plurality of terminals (D1, [0003],[0004] and [0008]), the system comprising:
- an information collector (the base station in D1, [0008]); and
- a coverage estimator (D1, claim 21),
wherein the information collector is configured to:
- select one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals being capable of communicating with both the first wireless access network and the second wireless access network (implicit in D1, since Base Station is only interested in data from wireless user equipment that is in contact with several wireless access networks since it is about handover, see D1, [0003]),
- obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals (D1, [0008] and [0009]), and
- provide the measurement information to the coverage estimator (D1, [0012] and claim 21), and

wherein the coverage estimator is configured to: obtain the measurement information from the information collector, and based on the obtained measurement information, generate the coverage assessment for the second wireless access network of the telecommunications infrastructure (D1, [0012]).

The subject-matter of claim 1 therefore differs from this known in D1 in that the "information collector is configured to instruct the selected one or more terminals to measure signals from the second wireless access network" and is therefore new.

The problem to be solved by the present invention may therefore be regarded as how to improve efficiency of measurement of data.

The solution proposed in claim 1 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons: D2 claim 1 discloses the selection of a mobile station by a base station that needs to perform measurements and sends the results to the base station. The man skilled in the art, would, when starting from D1 and faced with the general problem of improving the efficiency of measuring data come across the teaching of D2 in which a terminal can be selected. The combination of the teaching of D2 with the teaching of D1 is therefore considered not to involve an inventive step.

3 The same reasoning as in point 2 above applies, mutatis mutandis, to the subject-matter of the corresponding independent claims 6,11,12,14 and 15, which therefore are also considered not inventive.

4 Dependent claims 2-5,7-10,13 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step. See for example:
- Claims 3,8: D1, [0009]
- Claims 4,5,9,10: D1, [0009]

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO-ISA)

General information	For all international applications filed on or after 01/01/2004 the competent ISA will establish an ISR. It is accompanied by the WO-ISA. Unlike the former written opinion of the IPEA (Rule 66.2 PCT), the WO-ISA is not meant to be responded to, but to be taken into consideration for further procedural steps. This document explains about the possibilities.
Amending claims under Art. 19 PCT	Within 2 months after the date of mailing of the ISR and the WO-ISA the applicant may file amended claims under Art. 19 PCT directly with the International Bureau of WIPO. The PCT reform of 2004 did not change this procedure. For further information please see Rule 46 PCT as well as form PCT/ISA/220 and the corresponding Notes to form PCT/ISA/220.
Filing a demand for international preliminary examination	In principle, the WO-ISA will be considered as the written opinion of the IPEA. This should, in many cases, make it unnecessary to file a demand for international preliminary examination. If the applicant nevertheless wishes to file a demand this must be done before expiry of 3 months after the date of mailing of the ISR/WO-ISA or 22 months after priority date, whichever expires later (Rule 54bis PCT). Amendments under Art. 34 PCT can be filed with the IPEA as before, normally at the same time as filing the demand (Rule 66.1 (b) PCT). If a demand for international preliminary examination is filed and no comments/amendments have been received the WO-ISA will be transformed by the IPEA into an IPRP (International Preliminary Report on Patentability) which would merely reflect the content of the WO-ISA. The demand can still be withdrawn (Art. 37 PCT).
Filing informal comments	After receipt of the ISR/WO-ISA the applicant may file informal comments on the WO-ISA directly with the International Bureau of WIPO. These will be communicated to the designated Offices together with the IPRP (International Preliminary Report on Patentability) at 30 months from the priority date. Please also refer to the next box.
End of the international phase	At the end of the international phase the International Bureau of WIPO will transform the WO-ISA or, if a demand was filed, the written opinion of the IPEA into the IPRP, which will then be transmitted together with possible informal comments to the designated Offices. The IPRP replaces the former IPER (international preliminary examination report).
Relevant PCT Rules and more information	Rule 43 PCT, Rule 43bis PCT, Rule 44 PCT, Rule 44bis PCT, PCT Newsletter 12/2003, OJ 11/2003, OJ 12/2003

3NSDOCID: <XS_ 200704010CK.1 >

PTO/AIA/50 (09-14)
Approved for use through 01/31/2020. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995 no persons are required to respond to a collection of information unless it displays a valid OMB control number

REISSUE PATENT APPLICATION TRANSMITTAL

Address to:

Mail Stop Reissue
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Attorney Docket No.	12-678-REI
First Named Inventor	Ljupco Jorguseski
Original Patent Number	8,626,175
Original Patent Issue Date (Month/Day/Year)	01/07/2014
Express Mail Label No.	

APPLICATION FOR REISSUE OF: (*Check applicable box*) ☑ Utility Patent ☐ Design Patent ☐ Plant Patent

APPLICATION ELEMENTS (37 CFR 1.173)

1. ☑ **Fee Transmittal Form** (PTO/SB/56)
2. ☐ **Applicant asserts small entity status.** See 37 CFR 1.27
3. ☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. ☑ **Specification and Claims** in double column copy of patent format (*amended, if appropriate*)
5. ☑ **Drawing(s)** (*proposed amendments, if appropriate*)
6. ☑ **Reissue Oath/Declaration or Substitute Statement** (37 CFR 1.175) (PTO/AIA/05, 06, or 07)
7. ☑ **Application Data Sheet** **NOTE:** Benefit claims under 37 CFR 1.78 and foreign priority claims under 37 CFR 1.55 MUST be set forth in an Application Data Sheet (ADS).
8. ☑ **Original U.S. Patent currently assigned?** ☑ Yes ☐ No (*If Yes, check applicable box(es)*)
   - ☑ Written Consent of all Assignees (PTO/AIA/53)
   - ☑ 37 CFR 3.73(c) Statement (PTO/AIA/96)
9. ☐ **CD-ROM or CD-R** in duplicate, Computer Program (*Appendix*) or large table
   - ☐ Landscape Table on CD
10. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
    - a. ☐ Computer Readable Form (CRF)
    - b. ☐ Specification Sequence Listing on:
      - i. ☐ CD-ROM (2 copies) or CD-R (2 copies); **or**
      - ii. ☐ Paper
    - c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

11. ☑ **Statement of status and support for all changes to the claims.** See 37 CFR 1.173(c).
12. ☑ **Power of Attorney**
13. ☑ **Information Disclosure Statement (IDS)** PTOSB/08 or PTO-1449
    - ☑ Copies of citations attached
14. ☐ **English translation of Reissue Oath/Declaration** (*if applicable*)
15. ☐ **Return Receipt Postcard** (MPEP § 503) (Should be specifically itemized)
16. ☑ **Preliminary Amendment** (37 CFR 1.173; MPEP § 1453)
17. ☐ **Other:** _____

☐ This is a continuation reissue or divisional reissue application (*i.e.*, a second or subsequent reissue application for the same issued patent). (*Check box if applicable.*)

18. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 20306 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone			
Email					

Signature	/David A. Grabelsky/	Date	December 18, 2018
Name (Print/Type)	David A. Grabelsky	Registration No.	59,208

This collection of information is required by 37 CFR 1.173. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop Reissue, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks
First Named Inventor/Applicant Name:	Ljupco Jorguseski
Filer:	David A. Grabelsky
Attorney Docket Number:	12-678-REI

Filed as Large Entity

Filing Fees for Reissue (Utility)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY REISSUE BASIC	1014	1	300	300
REISSUE OR REISSUE DESIGN CPA SEARCH FEE	1114	1	660	660
REISSUE OR REISSUE DESIGN CPA EXAM. FEE	1314	1	2200	2200
Pages:				
Claims:				
INDEPENDENT CLAIMS REISSUE	1204	3	460	1380
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	4540

Electronic Acknowledgement Receipt

EFS ID:	34625162
Application Number:	16224047
International Application Number:	
Confirmation Number:	7372
Title of Invention:	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks
First Named Inventor/Applicant Name:	Ljupco Jorguseski
Customer Number:	20306
Filer:	David A. Grabelsky
Filer Authorized By:	
Attorney Docket Number:	12-678-REI
Receipt Date:	18-DEC-2018
Filing Date:	
Time Stamp:	16:03:46
Application Type:	Reissue (Utility)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$4540
RAM confirmation Number	121918INTEFSW16044500
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Specification	12-678-REI_Original_US_Patent_No_8626175.pdf	1004830 05971119b4861f7426eb2783ed8af306b755f7f1	no	13
Warnings:					
Information:					
2	Application Data Sheet	12-678-REI_Application_Data_Sheet.pdf	1256977 b7efdedf19686285fc316805e40c6bd1489d8b64	no	10
Warnings:					
Information:					
3	Consent of Assignee accompanying the declaration	12-678-REI_Consent_KPN.pdf	88438 1e4aefeffecbd506a06974e3c2bf600b680f39aa	no	2
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
4	Consent of Assignee accompanying the declaration	12-678-REI_Consent_TNO.pdf	532674 d4667637b4898e838dffb2eb72d9a517b54f005e	no	2
Warnings:					
Information:					
5	Assignee showing of ownership per 37 CFR 3.73	12-678-REI_Statement_under_373_c_KPN.pdf	130488 e0fd9a43e6fbf5ee149df9d5d3e033b98f913cb8	no	4
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					

6	Assignee showing of ownership per 37 CFR 3.73	12-678-REI_Statement_under_373_c_TNO.pdf	750649 2fa19c11157cf07302eb58344cb6f7e8dee16800	no	3
Warnings:					
Information:					
7	Reissue dec filed in accordance with MPEP 1414	12-678-REI_Assignee_Declaration_KPN.pdf	170820 36aa00c7b7b2be5cd86122a3fce7f40e6122c275	no	4
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
8	Reissue dec filed in accordance with MPEP 1414	12-678-REI_Assignee_Declaration_TNO.pdf	886890 51ee70941a655bc1fe1479d1daf4391282cb4c2a	no	4
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
9	Power of Attorney	12-678-REI_Power_of_Attorney_KPN.pdf	182332 44426f5e4e961e5e4841e11798c25e7e65940ce1	no	1
Warnings:					
Information:					
10	Power of Attorney	12-678-REI_Power_of_Attorney_TNO.pdf	1448666 48339b4dc438d84c192e44116499f9ebea0b178a	no	1
Warnings:					
Information:					
11	Preliminary Amendment	12-678-REI_Preliminary_Amendment_and_statement_pursuant_to_37_CFR_1_173_c.pdf	129292 3d8020566ca63a76cf107af38ea49ea6117eb24d	no	12
Warnings:					
Information:					
12	Information Disclosure Statement (IDS) Form (SB08)	12-678-REI_Information_Disclosure_Statement.pdf	612692 f1a38ba3c6ac117ccc413f9abf2551a6ed4cbde1	no	4

Warnings:					
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13	Foreign Reference	For_1_WO97_31502.pdf	1510858 e614bc02170e98da660999671881947 2e6429368	no	38
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Information:					
14	Foreign Reference	For_2_EP2076093A1.pdf	505556 6b310e878d669ab0a890caa53a35c1c5598c7ffe	no	13
Warnings:					
Information:					
15	Non Patent Literature	NPL_1_PCT_ISR.pdf	381007 502e19c01e36eb7a426fd9ef742bd612783e2fcf	no	9
Warnings:					
Information:					
16	Non Patent Literature	NPL_2_403448EP_extended_European_search_report.pdf	196733 fdfefda10756a05823b50843bc207a617ae544c6	no	6
Warnings:					
Information:					
17	Non Patent Literature	NPL_3_3GPP.pdf	1957158 ad98173b7601e6e4feb01dd1a1c5fcdcb6de8997	no	38
Warnings:					
Information:					
18	Transmittal Reissue Application	12-678-REI_Reissue_Transmittal_AIA50.pdf	316265 772c3a75bfba064071cb0b5447132215667 9c6ec	no	2
Warnings:					
Information:					
19	Fee Worksheet (SB06)	fee-info.pdf	37257 a6df7360ca52ca5ce64e38015edbe935865 1d4fa	no	2
Warnings:					
Information:					

Total Files Size (in bytes):	12099582

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	12-678-REI
	Application Number	
Title of Invention	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ljupco		Jorguseski	

Residence Information (Select One) US Residency ● Non US Residency Active US Military Service

City	Rijswijk	Country of Residence i	NL

Mailing Address of Inventor:

Address 1	Jozef Israelslaan 234		
Address 2			
City	Rijswijk	State/Province	
Postal Code	NL-2282 TR	Country i	NL

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Remco		Litjens	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Voorschoten	Country of Residence i	NL

Mailing Address of Inventor:

Address 1	Van Kempenstraat 22		
Address 2			
City	Voorschoten	State/Province	
Postal Code	NL-2252 VH	Country i	NL

Inventor 3 Remove

Legal Name

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	12-678-REI
	Application Number	
Title of Invention	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks	

Prefix	Given Name	Middle Name	Family Name	Suffix
	Haibin		Zhang	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	The Hague	Country of Residence [i]	NL

Mailing Address of Inventor:

Address 1	Usselincxstraat 142		
Address 2			
City	The Hague	State/Province	
Postal Code	NL-2593 VP	Country [i]	NL

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Adrian	Victor	Pais	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	Rijswijk	Country of Residence [i]	NL

Mailing Address of Inventor:

Address 1	Caen van Necklaan 25		
Address 2			
City	Rijswijk	State/Province	
Postal Code	NL-2281 BA	Country [i]	NL

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	20306		
Email Address	docketing@mbhb.com	Add Email	Remove Email

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	12-678-REI
	Application Number	
Title of Invention	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks	

Application Information:

Title of the Invention	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks		
Attorney Docket Number	12-678-REI	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	4	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	◯ Limited Recognition (37 CFR 11.9)
Customer Number	20306		

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	12-678-REI
	Application Number	
Title of Invention	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status: Patented — Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
	reissued of	13516905	2012-06-18	8626175	2014-01-07

Prior Application Status: — Remove

Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
13516905	a 371 of international	PCT/EP2010/069908	2010-12-16

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. — Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
09180130.8	EP	2009-12-21	

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. — Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	12-678-REI
	Application Number	
Title of Invention	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	12-678-REI
	Application Number	
Title of Invention	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Koninklijke KPN N.V.		
Mailing Address Information For Applicant:			
Address 1	Wilhelminakade 123		
Address 2			
City	Rotterdam	**State/Province**	
Country	NL	Postal Code	3072 AP
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	12-678-REI
	Application Number	
Title of Invention	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks	

Applicant 2 — Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO		
Mailing Address Information For Applicant:			
Address 1	Anna van Buerenplein 1		
Address 2			
City	s'Gravenhage	**State/Province**	
Country	NL	Postal Code	2595 DA
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

PTO/AIA/14 (02-18)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	12-678-REI
	Application Number	
Title of Invention	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks	

Organization Name	Koninklijke KPN N.V.

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	Wilhelminakade 123		
Address 2			
City	Rotterdam	**State/Province**	
Country i	NL	Postal Code	3072 AP
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Assignee 2

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	Anna van Buerenplein 1		
Address 2			
City	s'Gravenhage	**State/Province**	
Country i	NL	Postal Code	2595 DA
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	12-678-REI
	Application Number	
Title of Invention	Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks	

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/David A. Grabelsky/			Date (YYYY-MM-DD)	2018-12-18
First Name	David	Last Name	Grabelsky	Registration Number	59208

Additional Signature may be generated within this form by selecting the Add button. Add

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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REISSUE APPLICATION: CONSENT OF ASSIGNEE; STATEMENT OF NON-ASSIGNMENT

Docket Number (Optional)

12-678-REI

This is part of the application for a reissue patent based on the original patent identified below.

Name of Patentee(s)

Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO

Patent Number	Date Patent Issued
8,626,175	January 7, 2014

Title of Invention

Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

1. [X] Filed herein is a statement under 37 CFR 3.73(c). (Form PTO/AIA/96)

2. [ ] Ownership of the patent is in the inventor(s), and no assignment of the patent is in effect.

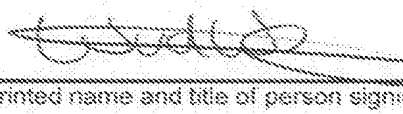
One of boxes 1 or 2 above must be checked. If multiple assignees, complete this form for each assignee. If box 2 is checked, skip the next entry and go directly to "Name of Assignee."

The written consent of all assignees and inventors owning an undivided interest in the original patent is included in this application for reissue.

The assignee(s) owning an undivided interest in said original patent is/are Nederlandse Organisatie voor Toeg[redacted], and the assignee(s) consents to the accompanying application for reissue.

Name of assignee/inventor (if not assigned)

Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO

Signature	Date
	December 17, 2018

Typed or printed name and title of person signing for assignee (if assigned)

Wemke van der Weij, Manager IP & Contracting, TNO

This collection of information is required by 37 CFR 1.172. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Koninklijke KPN N.V.

Application No./Patent No.: 8,626,175 Filed/Issue Date: January 7, 2014

Titled: Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

Koninklijke KPN N.V., a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose one of options 1, 2, 3 or 4 below):

1. ☐ The assignee of the entire right, title, and interest.

2. ☑ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☑ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose one of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 028396, Frame 0374, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
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STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Signature	13-12-2013 Date
Koenraad Wuyts Printed or Typed Name	Corporate Intellectual Property Officer, KPN Title or Registration Number

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/96 (08-12)
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO

Application No./Patent No.: 8,626,175 Filed/Issue Date: January 7, 2014

Titled: Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO, a Corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose one of options 1, 2, 3 or 4 below):

1. ☐ The assignee of the entire right, title, and interest.

2. ☑ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☑ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Koninklijke KPN N.V.

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose one of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 028396, Frame 0974, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/96 (08-10)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

Signature — December 17, 2010 (Date)

Wemke van der Weij — Printed or Typed Name

Manager IP & Contracting, TNO — Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
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REISSUE APPLICATION DECLARATION BY THE ASSIGNEE	Docket Number (Optional) 12-678-REI

At least one error upon which reissue is based is described below. If the reissue is a broadening reissue, a claim that the application seeks to broaden must be identified and the box below must be checked.

Applicant seeks to correct errors in claims 11 and 12 of the issued patent, both of which are potentially invalid under 35 U.S.C. § 112. Claim 11 recites, inter alia, an apparatus "configured for use in the method of claim 6..." Claim 12 recites, inter alia, a "computer program ... configured for ... performing one or more steps of the method of claim 6..." As such, both claims are potentially indefinite under 35 U.S.C. § 112(b) for reciting both apparatus (or software) and method limitations, and are potentially improper dependent claims under 35 U.S.C. § 112(d).

[Attach additional sheets, if needed.]

☐ **The application for the original patent was filed under 37 CFR 1.46 by the assignee of the entire interest.**

I hereby appoint:

☑ Practitioners associated with Customer Number: 20306

OR

☐ Practitioner(s) named below:

Name	Registration Number

as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith.

Correspondence Address: Direct all communications about the application to:

☑ The address associated with Customer Number: 20306

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

Signature	Date (Optional) 13-12-2018
Legal name of person signing	Koenraad Wuyts, Corporate Intellectual Property Officer, KPN
Address of Assignee	Wilhelminakade 123, 3072 AP Rotterdam, The Netherlands

Doc Code: REIS.DECL
Document Description: Reissue Declaration Filed In Accordance With MPEP 1414

PTO/AIA/06 (03-17)
Approved for use through 01/31/2020. OMB 0651-0033
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REISSUE APPLICATION DECLARATION BY THE ASSIGNEE	Docket Number (optional) 12-678-REI

I hereby declare that

The residence and mailing address of the inventor or joint inventors are stated below.

Name of the Assignee:

Koninklijke KPN N.V.

I am authorized to act on behalf of the assignee (if the assignee is a juristic entity).

The entire title to the patent identified below is vested in said assignee, or if there are multiple assignees/owners, all assignees/owners have executed a Reissue Application Declaration to account for the entire title of the patent identified below.

Inventor: Ljupco Jorguseski

Residence: City	State	Country
Rijswijk		NL

Mailing Address

Jozef Israelslaan 234

City	State	Zip	Country
Rijswijk		NL-2282 TR	NL

☑ Additional inventors are named on separately numbered sheets attached hereto.

Patent Number 8,626,175	Patent Issue Date January 7, 2014

I believe said inventor(s) to be the original inventor or original joint inventors of the subject matter which is described and claimed in said patent, for which a reissue patent is sought on the invention titled:

Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

the specification of which

☑ is attached hereto.

☐ was filed on _____ as reissue application number _____.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

I believe the original patent to be wholly or partly inoperative or invalid, for the reasons described below.
(Check all boxes that apply.)

☐ by reason of a defective specification or drawing.

☑ by reason of the patentee claiming more or less than he had the right to claim in the patent.

☐ by reason of other errors.

This collection of information is required by 37 CFR 1.175. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 36 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Supplemental Sheet for Reissue Application Declaration by the Assignee form PTO/AIA/06

Attorney Docket No. 12-678-REI

Additional Inventors

Remco Litjens
Van Kempenstraat 22
Voorschoten, NL-2252 VH, NL

Haibin Zhang
Usselincxstraat 142
The Hague, NL-2593 VP, NL

Adrian Victor Pais
Caen van Necklaan 25
Rijswijk, NL-2281 BA, NL

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc Code: REIS.DECL

Document Description: Reissue Declaration Filed In Accordance With MPEP 1414

PTO/AIA/06 (02-17)
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REISSUE APPLICATION DECLARATION BY THE ASSIGNEE	Docket Number (optional) 12-678-REI

I hereby declare that:

The residence and mailing address of the inventor or joint inventors are stated below.

Name of the Assignee:

Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO

I am authorized to act on behalf of the assignee (if the assignee is a juristic entity).

The entire title to the patent identified below is vested in said assignee, or if there are multiple assignees/owners, all assignees/owners have executed a Reissue Application Declaration to account for the entire title of the patent identified below.

Inventor Ljupco Jorguseski

Residence: City	State	Country
Rijswijk		NL

Mailing Address

Jozef Israelslaan 234

City	State	Zip	Country
Rijswijk		NL-2282 TR	NL

☑ Additional Inventors are named on separately numbered sheets attached hereto.

Patent Number 8,626,175	Patent Issue Date January 7, 2014

I believe said inventor(s) to be the original inventor or original joint inventors of the subject matter which is described and claimed in said patent, for which a reissue patent is sought on the invention titled:

Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

the specification of which

☑ is attached hereto.

☐ was filed on _____ as reissue application number _____.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

I believe the original patent to be wholly or partly inoperative or invalid, for the reasons described below.
(Check all boxes that apply.)

☐ by reason of a defective specification or drawing.

☑ by reason of the patentee claiming more or less than he had the right to claim in the patent.

☐ by reason of other errors.

This collection of information is required by 37 CFR 1.175. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PTO/AIA/06 (02-17)
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REISSUE APPLICATION DECLARATION BY THE ASSIGNEE

Docket Number (Optional) 12-678-REI

At least one error upon which reissue is based is described below. If the reissue is a broadening reissue, a claim that the application seeks to broaden must be identified and the box below must be checked.

Applicant seeks to correct errors in claims 11 and 12 of the issued patent, both of which are potentially invalid under 35 U.S.C. § 112. Claim 11 recites, inter alia, an apparatus "configured for use in the method of claim 6…" Claim 12 recites, inter alia, a "computer program … configured for … performing one or more steps of the method of claim 6…" As such, both claims are potentially indefinite under 35 U.S.C. § 112(b) for reciting both apparatus (or software) and method limitations, and are potentially improper dependent claims under 35 U.S.C. § 112(d).

[Attach additional sheets, if needed.]

☐ **The application for the original patent was filed under 37 CFR 1.46 by the assignee of the entire interest.**

I hereby appoint:

☑ Practitioners associated with Customer Number: 20306

OR

☐ Practitioner(s) named below

Name	Registration Number

as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith.

Correspondence Address: Direct all communications about the application to:

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OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

WARNING:

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Signature	Date (Optional) 06/MAY/ 14 2018
Legal name of person signing	Wernke van der Weij, Manager IP & Contracting, TNO
Address of Assignee	Anna van Buerenplein 1, 2595 DA 's-Gravenhage, The Netherlands

Supplemental Sheet for Reissue Application Declaration by the Assignee form PTO/AIA/06

Attorney Docket No. 12-678-REI

Additional Inventors

Remco Litjens
Van Kempenstraat 22
Voorschoten, NL-2252 VH, NL

Haibin Zhang
Usselincxstraat 142
The Hague, NL-2593 VP, NL

Adrian Victor Pais
Caen van Necklaan 25
Rijswijk, NL-2281 BA, NL

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
(Docket No. 12-678-REI)

In re the Application Reissue of:		)	
		)	
Ljupco Jorguseski et al.		)	
		)	
U.S. Patent No.:	**8,626,175**	)	**Examiner:** **TBA**
		)	
Issue Date:	**January 7, 2014**	)	**Art Unit:** **TBA**
		)	
For:	**Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks**	)	**Confirmation No.:** **TBA**

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AMENDMENT PURSUANT TO 37 C.F.R. § 1.173(b) AND STATEMENT PURSUANT TO 37 C.F.R. § 1.173(c)

This Amendment is being filed concurrently with the Reissue Application. Please consider the following amendments and remarks.

Amendments to the Claims begin on page 2 of this paper.

Remarks begin on page 10 of this paper.

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Amendments to the Claims

1. (Original) An automatic coverage assessment system configured for generating a coverage assessment for a second wireless access network of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals, the system comprising:

an information collector; and

a coverage estimator,

wherein the information collector is configured to:

(i) select one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network,

(ii) instruct the selected one or more terminals to measure signals from the second wireless access network,

(iii) obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals, and

(iv) provide the measurement information to the coverage estimator, and

wherein the coverage estimator is configured to:

(i) obtain the measurement information from the information collector, and

(ii) based on the obtained measurement information, generate the coverage assessment for the second wireless access network of the telecommunications infrastructure.

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2. (Original) The automatic coverage assessment system of claim 1, wherein the system further comprises a trigger configured for triggering the information collector to select the one or more terminals.

3. (Original) The automatic coverage assessment system of claim 1, wherein the information collector is further configured to obtain location information for at least one of the at least part of the plurality of terminals prior to selecting the one or more terminals.

4. (Original) The automatic coverage assessment system of claim 3, wherein the information collector is further configured to associate the location information with at least one of the selected one or more terminals and provide the location information associated with the at least one of the selected one or more terminals to the coverage estimator.

5. (Original) The automatic coverage assessment system of claim 1, wherein the information collector is further configured to provide location information valid upon obtaining the measurement information for at least one of the selected one or more terminals.

6. (Original) An automatic coverage assessment method for generating a coverage assessment for a second wireless access network of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals, the method comprising:

(i) collecting, at an information collector, information from terminals by:

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selecting one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network,

instructing the selected one or more terminals to measure signals from the second wireless access network,

obtaining measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals, and

providing the measurement information to a coverage estimator; and

(ii) generating, at the coverage estimator, the coverage assessment for the second wireless access network by:

obtaining the measurement information from the information collector, and

based on the obtained measurement information, generating the coverage assessment for the second wireless access network of the telecommunications infrastructure.

7. (Original) The automatic coverage assessment method of claim 6, further comprising the step of triggering the information collector to select the one or more terminals.

8. (Original) The automatic coverage assessment method of claim 6, further comprising the step of obtaining location information for at least one of the at least part of the plurality of terminals prior to selecting the one or more terminals.

9. (Original) The automatic coverage assessment method of claim 8, further comprising the

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step of providing the location information valid upon obtaining the measurement information for at least one of the selected one or more terminals.

10. (Original) The automatic coverage assessment method of claim 8, further comprising:

associating the location information with at least one of the selected one or more terminals, and

forwarding the location information associated with the at least one of the selected one or more terminals to the coverage estimator.

11. (Amended) A mobile user terminal configured for use in [the method of claim 6] an automatic coverage assessment method for generating a coverage assessment for a second wireless access network of a telecommunications infrastructure, the telecommunications infrastructure comprising a first wireless access network and the second wireless access network, wherein the first and second wireless access networks are capable of providing services to a plurality of terminals, and wherein the mobile user terminal [comprising] comprises:

means for measuring signals from the second wireless access network; and

means for providing the measurement information to at least one of [the] an information collector [and the] or a coverage estimator based on the measured signals,

wherein the mobile user terminal is further configured to:

receive an instruction from the information collector to measure signals,

wherein the information collector carries out operations including collecting information from terminals by:

selecting one or more terminals from at least part of the plurality of

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the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network,

instructing the selected one or more terminals to measure signals from the second wireless access network,

obtaining measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals, and

providing the measurement information to a coverage estimator; and

measure signals from the second wireless access network;

wherein the coverage estimator carries out operations including generating the coverage assessment for the second wireless access network by:

obtaining the measurement information from the information collector, and

based on the obtained measurement information, generating the coverage assessment for the second wireless access network of the telecommunications infrastructure.

12. (Amended) A [computer program comprising software code portions configured for,] non-transitory computer-readable medium having instructions stored thereon that, when executed by a processor of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network, the first and second wireless access networks

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capable of providing services to a plurality of terminals, causes the telecommunications infrastructure to carry out operations of an automatic coverage assessment method for generating a coverage assessment for the second wireless access network, the operations including:[, performing one or more steps of the method of claim 6]

(i) collecting, at an information collector, information from terminals by:

selecting one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network,

instructing the selected one or more terminals to measure signals from the second wireless access network,

obtaining measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals, and

providing the measurement information to a coverage estimator; and

(ii) generating, at the coverage estimator, the coverage assessment for the second wireless access network by:

obtaining the measurement information from the information collector, and

based on the obtained measurement information, generating the coverage assessment for the second wireless access network of the telecommunications infrastructure.

13. (Original) A network node for use in a telecommunications infrastructure comprising a first wireless access network and a second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals, the node comprising:

means for selecting one or more terminals from at least part of the plurality of the

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terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network;

means for instructing the selected one or more terminals to measure signals from the second wireless access network,

means for obtaining measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals; and

means for providing the measurement information to a coverage estimator,

wherein the coverage estimator is configured to generate the coverage assessment for the second wireless access network of the telecommunications infrastructure based on the measurement information provided by the network node.

14. (Original) The network node of claim 13, wherein the coverage estimator is included within the network node.

15. (Original) A network node for use in a telecommunications infrastructure comprising a first wireless access network and a second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals, the node comprising:

means for obtaining measurement information from an information collector; and

means for generating the coverage assessment for the second wireless access network of the telecommunications infrastructure based on the obtained measurement information,

wherein the information collector is configured to:

(i) select one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the

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first wireless access network and the second wireless access network,

(ii) instruct the selected one or more terminals to measure signals from the second wireless access network,

(iii) obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals, and

(iv) provide the measurement information to the network node.

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Remarks

Status of the Claims Pursuant to 37 C.F.R. § 1.173(c)

1. All claim amendments are supported by the specification and figures.

Currently pending are claims 1-15, of which claims 1, 6, 11, 12, 13, and 15 are independent and the remainder are dependent. Applicant has amended claims 11 and 12 as described below.

Applicant submits the amendments to the claims are fully supported by the specification and figures.

Applicant has amended claim 11 to incorporate all of the limitations of claim 6, as issued in U.S. Patent No. 8,626,175 ("'175 patent" hereinafter), and to remove reference to claim 6. Applicant has also added a limitation describing the recited "mobile user terminal" as being configured to the "receive an instruction from the information collector to measure signals" and to "measure signals from the second wireless access network." Applicant has further amended claim 11 to ensure consistency of antecedent basis. Support for these amendments can be found in the issued patent at least at column 6, line 63 – column 7, line 7; column 9, lines 14-16; Figure 3; and claim 6.

Applicant has amended claim 12 to incorporate all of the limitations of claim 6, as issued in the '175 patent, and to remove reference to claim 6. Applicant has also amended claim 12 to be directed to a "non-transitory computer-readable medium having instructions stored thereon that, when executed by a processor of a telecommunications infrastructure … causes the telecommunications infrastructure to carry out operations … including" actions described in the limitations incorporated from claim 6. Support for these amendments are the same as those for

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claim 11, and in addition can be found in the issued patent at least at column 7, lines 14-19; and column 11, lines 4-18.

No new matter has been added by way of any of the above amendments.

2. The claims in this application, as filed, narrow the scope of the claims of the issued patent.

Applicant seeks to correct errors in the issued patent in claims 11 and 12, both of which are potentially subject to findings of invalidity under 35 U.S.C. § 112.

Specifically, claim 11 of the '175 patent recites, *inter alia*, "[a] mobile user terminal configured for use in configured for use in the method of claim 6..." As such, claim 11 as originally issued is potentially subject to interpretation as being indefinite under 35 U.S.C. § 112(b) for reciting both apparatus, and method limitations. Additionally, claim 11, while being an independent apparatus claim, is also potentially subject to interpretation as an improper dependent claim under 35 U.S.C. § 112(d).

Claim 12 of the '175 patent recites, *inter alia*, "[a] computer program comprising software code portions configured for, when executed by a processor, performing one or more steps of the method of claim 6..." As such, claim 12 as originally issued is also potentially subject to interpretation as being indefinite under 35 U.S.C. § 112(b) for reciting both a "computer program comprising software code portions," and method limitations. Additionally, claim 12, while being an independent "computer program" product claim, is also potentially subject to interpretation as an improper dependent claim under 35 U.S.C. § 112(d).

Applicant submits that the amendments to claim 11, described above, address the errors in claim 11 by removing explicit reference to claim 6, while incorporating the limitations of claim 6 and adding additional, narrowing limitations that cast the incorporated limitations as an

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environment in which the recited "mobile user terminal" is configured for use. Accordingly, claim 11 as amended is a proper independent claim directed to a "mobile user terminal." By incorporating all the limitations of claim 6, the amendment to claim 11 also does not broaden claim 11 as issued in the '175 patent.

Applicant submits that the amendments to claim 12, described above, similarly address the errors in claim 12 by removing explicit reference to claim 6, while incorporating the limitations of claim 6 and adding an additional, narrowing limitation that clarifies the tangible-product nature of the subject matter and casts the incorporated limitations as operations specified by stored instructions. Accordingly, claim 12 as amended is a proper independent claim directed to a "non-transitory computer-readable medium." By incorporating all the limitations of claim 6, the amendment to claim 12 also does not broaden claim 12 as issued in the '175 patent.

If there are any questions or comments regarding the above amendments, the Office is encouraged to contact the undersigned at (312) 913-3353.

Respectfully submitted,

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(12) **United States Patent**
Jorguseski et al.

(10) **Patent No.: US 8,626,175 B2**
(45) **Date of Patent: Jan. 7, 2014**

(54) **METHOD AND SYSTEM FOR AUTOMATIC COVERAGE ASSESSMENT FOR COOPERATING WIRELESS ACCESS NETWORKS**

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(73) Assignees: **Koninklijke KPN N.V.**, The Hague (NL); **Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO**, Delft (NL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 23 days.

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§ 371 (c)(1),
(2), (4) Date: **Jun. 18, 2012**

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PCT Pub. Date: **Jul. 7, 2011**

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H04W 40/00 (2009.01)

(52) **U.S. Cl.**
USPC **455/446**; 455/422.1; 455/450; 455/418; 455/423

(58) **Field of Classification Search**
USPC 455/446, 422.1, 450, 418, 423
See application file for complete search history.

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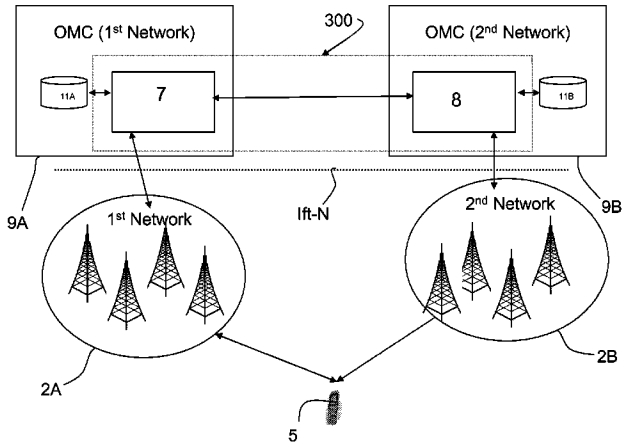
* cited by examiner

Primary Examiner — Nghi H Ly
(74) *Attorney, Agent, or Firm* — McDonnell Boehnen Hulbert & Berghoff LLP

(57) **ABSTRACT**

The invention relates a method and system for assessing coverage of a wireless access network within a desired area via cooperating wireless access networks and terminals capable of measurement and reporting across the different wireless access networks. The cooperation refers to, among other things, the ability of obtaining coverage assessment for one of the wireless access networks using results of the measurements collected at one of the other wireless access networks. In this manner, more accurate and complete coverage assessment may be obtained, relative to the prior art approaches.

15 Claims, 4 Drawing Sheets



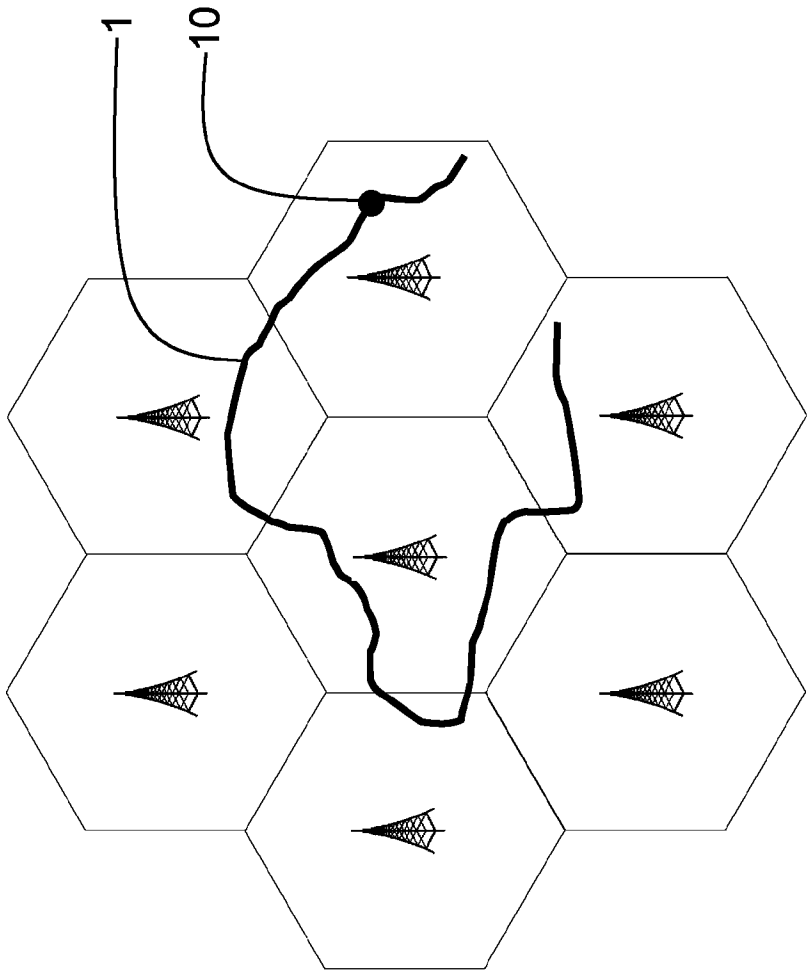


FIG. 1

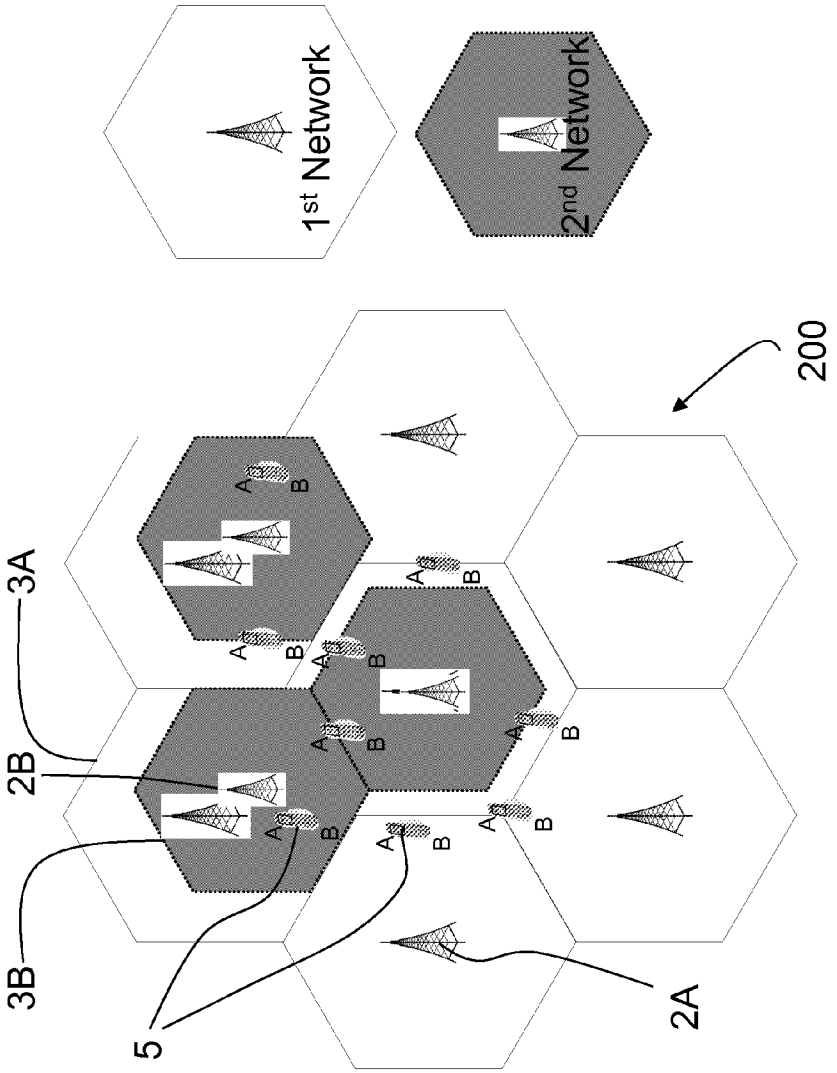


FIG. 2

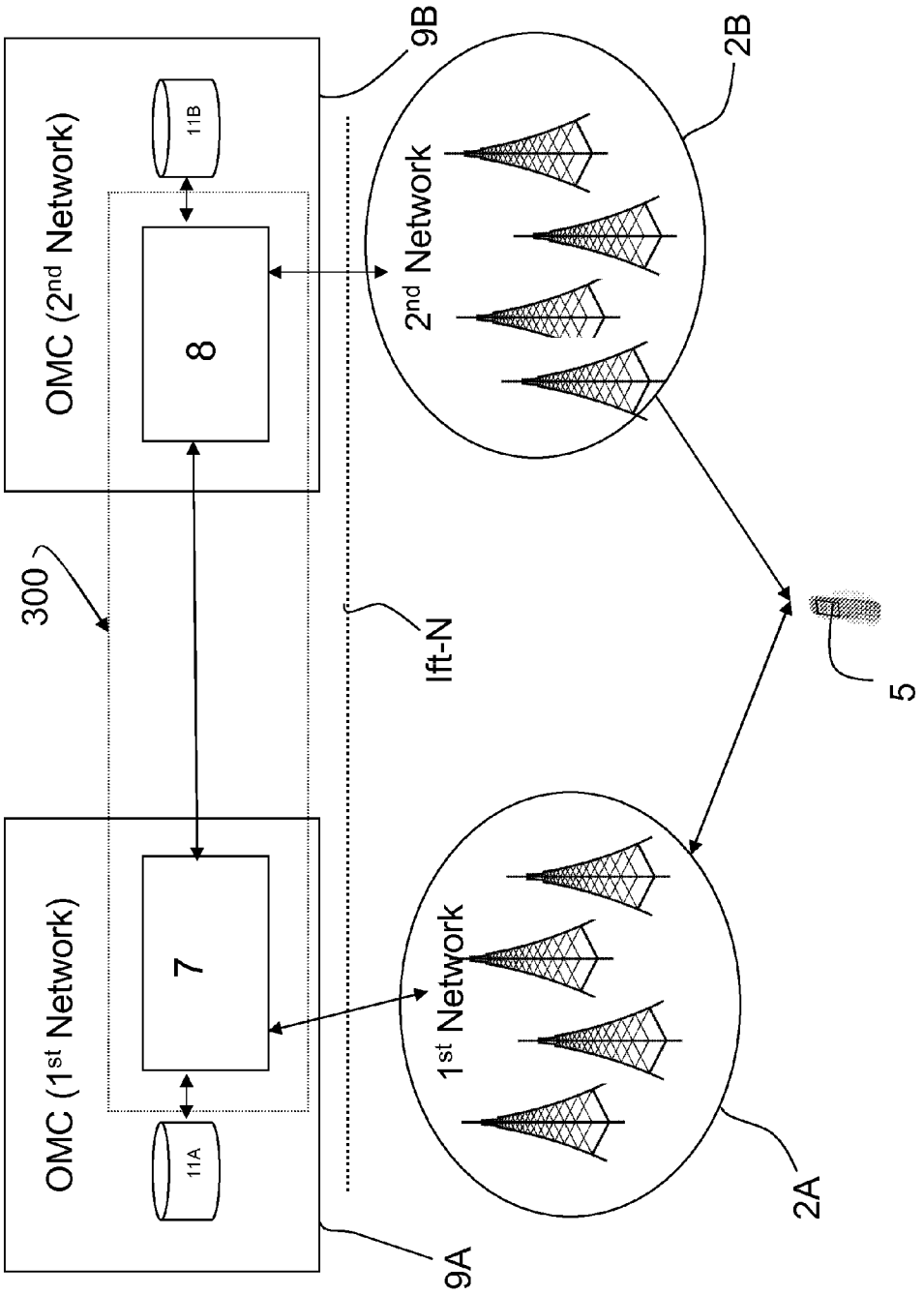

OMC (2nd Network)
11B
8
9B
2nd Network
2B
300
Ift-N
5
OMC (1st Network)
7
11A
1st Network
2A
9A

FIG. 3

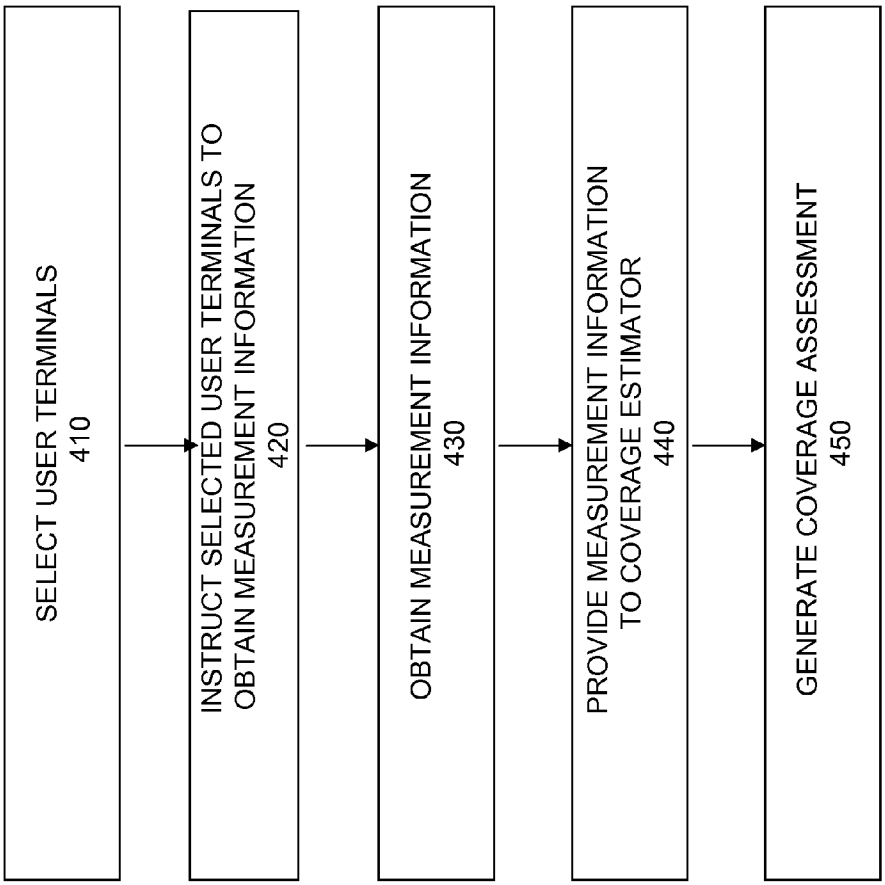

SELECT USER TERMINALS
410
INSTRUCT SELECTED USER TERMINALS TO OBTAIN MEASUREMENT INFORMATION
420
OBTAIN MEASUREMENT INFORMATION
430
PROVIDE MEASUREMENT INFORMATION TO COVERAGE ESTIMATOR
440
GENERATE COVERAGE ASSESSMENT
450

FIG. 4

METHOD AND SYSTEM FOR AUTOMATIC COVERAGE ASSESSMENT FOR COOPERATING WIRELESS ACCESS NETWORKS

CROSS REFERENCE TO RELATED APPLICATIONS

The present application is a national stage entry of PCT/EP2010/069908, filed Dec. 16, 2010, and claims priority to EP 09180130.8, filed Dec. 21, 2009. The full disclosures of EP 09180130.8 and PCT/EP2010/069908 are incorporated herein by reference.

FIELD OF THE INVENTION

The invention relates to the field of telecommunications infrastructures. More specifically, the invention relates to the field of coverage assessment in telecommunications infrastructures comprising wireless access networks.

BACKGROUND OF THE INVENTION

Wireless access networks are used to provide terrestrial coverage via placement of base stations throughout the desired coverage area. In order to provide adequate service to the clients, wireless operators constantly evaluate the coverage area of their wireless access networks. Such an evaluation may, for example, be done in the planning phase via coverage calculations based on models for the attenuation of the radio signals, terrain configuration data and the configuration data about the type and placement of the base stations. Such calculations provide, for the area under consideration and for each base station included in the calculations, a reasonably complete indication of the estimated signal strength but only with a limited accuracy, given the necessary simplifications made in the attenuation model and the limited degree of details in the underlying data bases. In their operational processes, wireless operators frequently use drive tests in order to assess the coverage of their wireless access networks. These drive tests consist of measurement routes that are traversed by a measurement terminal often mounted on a vehicle, as illustrated in FIG. **1**, where the measurement route is shown with a line **1** and the measurement terminal (vehicle) location is shown as a dot **10**. Such measurements provide, for each base station included in the measurement, a reasonably accurate indication of the signal strength but only for the very limited set of locations along the measurement route **1**. Besides the drive measurements the operators collect statistical information from the network nodes about events that can be used to roughly indicate coverage problems such as failed connections, inter-radio access technology (inter-RAT) handovers and cell reselections, etc.

The coverage assessment options presented above have a number of drawbacks. One is that the planning process is generally characterised by a certain degree of inaccuracy due to e.g. estimation errors in the radio propagation modelling and/or inaccurate terrain configuration data. Another drawback is that the drive tests provide the coverage assessment only along the measurement route. Moreover, drive tests are too costly for estimation of the overall coverage. Yet another drawback is that the network statistics collection has its basic limitation in that only the signals and events for the terminals that are connected to/camping on the network may be reported (and not the terminals that do not have coverage). Moreover, such statistics can only roughly indicate the locations of coverage gaps.

As the foregoing illustrates, there exists a need in the art for a system and method for generating a coverage assessment in a telecommunications infrastructure in a manner that minimizes or eliminates at least some of the drawbacks of the current approaches described above.

SUMMARY OF THE INVENTION

An automatic coverage assessment system configured for generating a coverage assessment for a second wireless access network of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network is disclosed. The first and second wireless access networks are capable of providing services to a plurality of terminals such as e.g. user terminals.

The system includes an information collector and a coverage estimator. In one embodiment, the information collector may be included within the first wireless access network, while the coverage estimator may be included within the second wireless access network. The information collector may be configured for collecting information from terminals via the first wireless access network. In another embodiment, the information collector and the coverage estimator may be included within the second wireless access network. In such an embodiment, the information collector may be configured for collecting information from terminals via the first and the second wireless access networks.

The coverage estimator may be configured for receiving information from the information collector. The information collector may be configured to select one or more terminals from at least part of the plurality of the terminals, where the at least part of the plurality of the terminals is capable of communicating with both the first wireless access network and the second wireless access network. The information collector may further be configured to obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals and provide the measurement information to the coverage estimator. In one embodiment, the information collector may obtain the measurement information in response to an instruction provided to the selected one or more terminals to measure signals from the second wireless access network (suitable for generating the coverage assessment of the second wireless access network). The measurement information may e.g. include signal strength, cell identifications of the second wireless access network, information related to the location of the terminal (e.g. GPS coordinates), and/or information that can be used for location estimation (including e.g. signal strength indications, timing information, power information). The coverage estimator may be configured to obtain the measurement information from the information collector and, based on the obtained measurement information, generate the coverage assessment for the second wireless access network of the telecommunications infrastructure.

As used herein, the phrase "terminal capable of communication with both the first and second wireless access networks" is intended to cover not only wireless communication, but also include an indirect communication path (e.g. wirelessly to the first network and then via some fixed connection to the second network or via a third network to the second network). Furthermore, the communication with the first network could, but does not have to, take place at the same time as the communication with the second network.

Optionally, the automatic coverage assessment system may further include a first database connected to the information collector and configured for storing the measurement

information and/or a second database connected to the coverage estimator and configured for storing the coverage assessment.

In various embodiments, the first and second access wireless access network respectively may for example include, respectively, a first network using a first radio access technology and a second network using a second radio access technology, a first network using a first radio spectrum and a second network using a second radio spectrum, a first network of a first network operator and a second network of a second network operator, or a first (sub)network and a second (sub)network of a same network operator.

In one embodiment, the telecommunications infrastructure may include at least one operations and maintenance centre, the first wireless access network may include a number of first base stations, and the second wireless access network may include a number of second base stations. In such an embodiment, at least a part of the automatic coverage assessment system may be contained in the operations and maintenance centre and/or the first and/or second base stations.

Based on the generated coverage assessment, the coverage estimator may further be configured to e.g. select geographical areas where installation of new base stations could be considered and/or identify existing base stations for which adjustments and/or extensions could be considered. Further, using the generated coverage assessment, the coverage estimator may be configured to generate one or more instructions based on a comparison of the coverage assessment with a previously generated coverage assessment.

A corresponding method, computer program, mobile user terminal, and network nodes that allow generating a coverage assessment for a second wireless access network of a telecommunications infrastructure as defined above are also disclosed.

The disclosed systems and a method are implemented based on the observation that an assessment of the coverage of a wireless access network within a desired area may be obtained via cooperating wireless access networks and terminals capable of measurement and reporting across the different wireless access networks. The cooperation refers to, among other things, the ability of generating coverage assessment for one of the wireless access networks using results of the measurements collected through one of the other wireless access networks. In this manner, more accurate and/or complete and/or less costly coverage assessment may be obtained, relative to the prior art approaches. Furthermore, the disclosed system and method may allow obtaining a coverage assessment for areas which are currently "out of coverage" by the prior art solutions.

One embodiment of the present invention provides a trigger configured for triggering the information collector to select the one or more terminals. The trigger may be included within the first wireless access network and may be event-based or periodical, with period T. In order to decrease or avoid collection of excessive location and/or measurement information, the trigger may be applied selectively depending on where and/or when the coverage assessment is needed.

Another embodiment allows avoiding excessive collection of information from terminals via the first wireless access network by obtaining location information for at least one of the at least part of the plurality of terminals prior to selecting the one or more terminals. The location information may be determined for terminals either in an idle mode (i.e. without an existing connection) or in an active mode (i.e. with an existing connection), as long as these terminals are capable of communicating with both the first and the second wireless access networks.

The location information may be obtained via location estimation techniques, which are known in the art, and/or via each of the at least part of the plurality of terminals providing their location information to the information collector (e.g. via terminals equipped with GPS receivers capable of determining their locations).

When the location information is obtained from the terminals, a radio resource control (RRC) channel may be used to convey the location information (as well as the measurement information) from the terminals to the information collector (possibly via the first wireless access network). A common data connection (e.g. via the wireless network that is currently serving the terminal) may also be used to convey information from the terminals to the information collector. In the remainder of the text, whenever an RRC channel is mentioned to convey information between two entities, it is implied that any other communication channel, such as e.g. a common data connection, may also be used.

Based on the location information, only terminals located in the area for which the coverage assessment should be generated may be selected for obtaining the measurement information.

Alternatively, the location information may be determined by the first wireless access network (e.g., by the information collector) up to the cell level or group of cells (e.g., location/routing/tracking area level) by selecting the at least part of the plurality of terminals to be terminals in a specified geographical area. For example, some or all terminals in a particular city area, a whole city, a district, a province/state, etc. may be selected to be the terminals from which then the one or more terminals are selected. This embodiment may be advantageous when location estimation techniques are not available, when exact location information of the terminals is not needed for selecting the terminals that should perform the measurements or when only coarse location information (e.g. cell-level location information) is sufficient.

One embodiment of the present invention specifies providing location information valid upon obtaining the measurement information for at least one of the selected one or more terminals.

Sometimes it may be possible that the location of the selected terminals when they are actually obtaining the measurement information is different from what it was when the location information was obtained by the first wireless access network. This could happen when the terminal moves during this (small) period. Therefore, such an embodiment allows updating the location information for at least one of the selected one or more terminals with the location information of the terminals at the time when the measurement information is obtained by the terminals. In case that the location information is provided by the terminal itself, the new location may be sent along with the measurement results. In case that the location is estimated by the first wireless access network, the network may re-estimate the location when it obtains the measurement results. If the new location is different from the old one, the new location may be used by updating the old location information.

Other times, location information or a location estimation may be provided after a terminal has been added to the set of measuring terminals (selected terminals). Therefore, such an embodiment also allows providing location information for at least one of the selected one or more terminals valid at the time of the measurement.

One embodiment sets forth associating the location information with at least one of the selected one or more terminals and providing the location information associated with the at least one of the selected one or more terminals to the coverage

estimator. Such an embodiment advantageously allows providing the coverage estimator not only with the measurement information, but also with the location information associated with at least one of the selected one or more terminals, from which the coverage estimator may generate the coverage assessment (i.e., a representation of locations/pixels and e.g. associated signal strengths of the second wireless access network).

In one further embodiment, the information collector may be further configured to update the selected one or more terminals to eliminate terminals that are associated with the location information indicative of a location not included in a predefined location area for which the coverage assessment is generated, prior to forwarding the location information associated with the at least some of the selected one or more terminals to the coverage estimator. This embodiment may be particularly advantageous when e.g. one of the selected terminals moved during the period between obtaining the initial location information and actually performing the measurements as instructed by the information collector. If the new location of such a terminal is out of the area for which the coverage assessment should be generated, the new location and the corresponding measurement may be stored in a database for future use, but not used at the moment for the coverage assessment of the second wireless access network.

In one embodiment, the information collector may be configured to select the one or more terminals when the one or more terminals comprise terminals in a predefined location area for which the coverage assessment is generated. This specifies one criterion that may be advantageously applied in selecting the one or more terminals for obtaining the measurement information.

In other embodiments, the information collector may be configured to select the one or more user terminals when the one or more user terminals satisfy one or more of different criteria. For example, one criterion may be that the one or more user terminals use a predefined service via the first wireless access network while, according to operator policy, usage of the predefined service is preferred via the second wireless access network. Another criterion may be that a self-optimization or a manual optimization of a radio coverage is performed for one or more base stations within the second wireless access network and the one or more user terminals comprise user terminals in those cells within the first wireless access network that have inter-RAT neighbour relation with cells within the second wireless access network where the optimization takes place. Yet another criterion may be that the one or more user terminals comprise user terminals from one or more cells in the first wireless access network associated with a planned coverage overlap with one or more cells in the second wireless access network where the coverage should be assessed.

In various embodiments, an RRC signalling channel may be used to convey information between any of the terminals and the first and second wireless access networks.

Hereinafter, embodiments of the invention will be described in further detail. It should be appreciated, however, that these embodiments may not be construed as limiting the scope of protection for the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1** provides a schematic illustration of a drive test measurement of the wireless access network coverage, according to prior art;

FIG. **2** provides a schematic illustration of a telecommunications infrastructure comprising two wireless access networks and terminals supporting both networks, according to one embodiment of the present invention;

FIG. **3** illustrates an example of implementing a coverage assessment system, according to one embodiment of the present invention; and

FIG. **4** provides a flow diagram of method steps for generating a coverage assessment for one wireless access network in a telecommunications infrastructure illustrated in FIG. **2**, according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. **2** provides a schematic illustration of a telecommunications infrastructure **200**, according to one embodiment of the present invention. The telecommunications infrastructure **200** comprises a first wireless access network and a second wireless access network, represented in FIG. **2** as networks **2**A and **2**B, respectively (including base stations, e.g. NodeBs in UMTS and/or eNodeBs in LTE) defining respective coverage areas **3**A (solid lines) and **3**B (dashed lines). It should be noted that the dimensions of the coverage areas **3**A, **3**B may not be constant in time.

A plurality of mobile terminals is associated with the first and second wireless access networks **2**A, **2**B. At least a part of these terminals can support multiple radio access systems (this part of the terminals is shown in FIG. **2** as terminals **5** which are capable of communicating with both the first and second wireless access networks **2**A, **2**B). The invention described herein is applicable in, but not limited to, areas where several wireless access networks are cooperating, for example, in terms of inter-RAT handover and/or cell reselection.

In one embodiment, the first and second wireless access networks **2**A, **2**B may be operated with a single operations and maintenance centre (OMC), not shown in FIG. **2**. The first and second wireless access networks **2**A, **2**B may e.g. differ in radio access technology (e.g. GSM and UMTS or UMTS and LTE) or the used frequency spectrum (e.g. the 900 MHz and 1800 MHz frequency bands)

In another embodiment, each of the first and second wireless access networks **2**A, **2**B is operated with a corresponding OMC (not shown in FIG. **2**). The corresponding OMCs may be at least connected to one another in order to exchange information for generating a coverage assessment.

Further network elements may be arranged in the telecommunications infrastructure **200** of FIG. **2** between the one or more OMCs and the networks **2**A and **2**B of the corresponding wireless access technologies, as known to the person skilled in the art.

In the telecommunications infrastructure **200** of FIG. **2**, a coverage assessment system, the operation of which will be further described with reference to FIG. **3**, may be included within the one or more OMCs. However, the coverage assessment system is not necessarily implemented in such a centralized manner, but may also be decentralised by implementing coverage assessment functionality in other network elements (such as base stations) and using connections between these elements. Hybrid implementations are also envisaged. Signals for generating coverage assessment can be exchanged over management or traffic interfaces.

FIG. **3** illustrates an example of implementing a coverage assessment system **300**, according to one embodiment of the present invention. As shown, the coverage assessment system **300** includes an information collector **7** and a coverage estimator **8**. The information collector **7** is configured for collect-

ing information from some of the terminals **5** via the first wireless access network **2**A and providing the information to the coverage estimator **8**. The coverage estimator **8** is configured for connecting to and receiving information from the information collector **7** and, based on the received information, generating the coverage assessment for the second wireless access network **2**B.

In the embodiment shown in FIG. **3**, the information collector **7** is included within an OMC **9**A of the first wireless access network **2**A and the coverage estimator **8** is included within an OMC **9**B of the second wireless access network **2**B. Alternatively, the first and second wireless access networks **2**A, **2**B may share the same OMC.

In one embodiment, the information collector **7** and the coverage estimator **8** may be largely implemented as software executed by a processor and making use of memory (not shown in FIG. **3**). In other embodiments, the information collector **7** and the coverage estimator **8** may be implemented in hardware or in a combination of software and hardware.

Optionally, the information collector **7** may be connected to a database **11**A configured to store the location and measurement information (described in greater detail in FIG. **4**). Also optionally, the coverage estimator **8** may be connected to a database **11**B configured to store the results of coverage assessments for future use.

FIG. **4** provides a flow diagram of method steps for generating a coverage assessment for one wireless access network in a telecommunication infrastructure comprising two or more cooperating wireless access networks using the coverage assessment system **300**, according to one embodiment of the present invention. While the method steps are described in conjunction with FIGS. **2** and **3**, persons skilled in the art will recognize that any system configured to perform the method steps, in any order, is within the scope of the present invention. Furthermore, while the method is illustrated to include only two cooperating wireless access networks, the method is also applicable for any arbitrary number of cooperating wireless access networks.

In one embodiment of FIG. **4**, consider that at a given location the first wireless access network **2**A has a good radio coverage (and, therefore, the terminals **5** can connect to it) but there is no or poor radio coverage from the second wireless access network **2**B. Further consider that the first wireless access network **2**A is a 3G UMTS network, while the second wireless access network **2**B is an LTE network. For an operator who already has an UMTS network, the UMTS network typically has a more extended coverage than the LTE network, especially at the beginning of the LTE deployment. As previously described, the terminals **5** are capable of communicating with both the first and second wireless access networks **2**A, **2**B.

The method for generating a coverage assessment may begin with an optional step (not shown in FIG. **4**) where the information collector **7** requests, via the 3GPP Itf-N interface to the UMTS network (the first wireless access network **2**A in this example), the location of all or a group of terminals **5** camping on or connected to the UMTS network. The UMTS network can either use its terminal positioning technologies specified in the 3GPP standard TS 25.305 to estimate the location of terminals, or ask the terminals via RRC signalling to provide the location information in case that the terminals are equipped with GPS.

Alternatively, the location information may be determined by the UMTS network (e.g., by the information collector **7** or some other module within the UMTS network) up to the cell level or group of cells (e.g., location/routing/tracking area level) by selecting the terminals in a specified geographical area. For example, some or all of the terminals **5** in a particular city area, a whole city, a district, a province, or a state may be selected for performing the measurements described below. Such an implementation may be advantageous when location estimation techniques are not available, when exact location information of the terminals **5** is not needed for selecting the terminals that should perform the measurements or when only coarse location information (e.g. cell-level location information) is sufficient.

In one embodiment, the coverage assessment system **300** may include a trigger for triggering the procedure of generating the coverage assessment, optionally including the step of obtaining the location information for the terminals **5** using any of the approaches discussed above. The trigger may be event-based (e.g. the instruction from the coverage estimator **8** to obtain measurement information) or periodical, with period T.

In step **410**, the information collector **7** selects one or more of the terminals **5** for obtaining measurement information. This instruction may also be sent via the RRC signalling of the UMTS network. It should be noted that when the location information is obtained prior to step **410**, then in step **410** only terminals located in the area for which the coverage assessment should be generated may be selected for obtaining the measurement information, thus avoiding collection of excessive measurement information.

The information collector **7** may also be configured to select the one or more of the terminals **5** according to one of the following alternative embodiments. In one embodiment, those terminals are selected that use a particular service via the UMTS network while, according to the operator policy, usage of that service is preferred via the LTE network. In another embodiment, a self-optimization or a manual optimization of a radio coverage may be performed for one or more base stations within the LTE network, and then the selected one or more terminals only comprise terminals in those cells within the UMTS network that have inter-RAT neighbour relation with cells of the LTE network where the optimization takes place. In yet another embodiment, the selected one or more terminals comprise terminals from one or more cells in the UMTS network where there is a planned coverage overlap with one or more cells in the second wireless access network **2**B where the coverage should be assessed.

Persons skilled in the art will be able to complement the selection criteria described herein with additional selection criteria that may be relevant for the assessment of the coverage of the second wireless access network **2**B.

The method then continues to step **420**, where the information collector **7** instructs the selected one or more terminals, via the UMTS network, to measure signals from the LTE network. In step **430**, the information collector **7** obtains measurement information indicative of the signals measured from the LTE network by the selected one or more terminals. The measurement information may e.g. include indications about cell identification, indications about signal strength, indications about system information provided by the measured cells, indications about timing, indications about the moment a measurement has been made, indications about the location or estimated location where a measurement has been made, etc. The measurement information relates at least to the LTE network and may additionally relate to measurements in the UMTS network, for example in order to obtain an LTE network signal strength measurement relative to a UMTS signal strength measurement and/or to use either information to perform, to support or to verify a location estimate. The

measurement information may be sent via RRC signalling to the UMTS network and further via the Itf-N interface to the information collector **7**.

Sometimes it may be possible that the location of the selected terminals when they actually perform the measurements is different from what it was when the initial location information was obtained in the optional step prior to step **410**. This could happen when the selected terminals move during this period. Therefore, in one embodiment, the information collector **7** may be configured to update the location information for each of the selected one or more terminals with the location information valid when the measurement information was obtained from them. In case that the location information is provided by the terminal itself, the terminal may send the new location information along with the measurement results via e.g. RRC channel of the UMTS network. In case that the location of a particular selected terminal is estimated by the UMTS network, the UMTS network may re-estimate the location when it obtains the measurement results from that selected terminal. In any case, if the new location is different from the old one, the new location may be used by updating the old location information.

In another embodiment, the information collector **7** may be configured to update the location information for each of the selected one or more terminals after obtaining the measurement information from them. In such an embodiment, if the new location is different from the old one, an interpolation may be performed to estimate the measurement location from the old and the new locations.

Furthermore, if one of the selected terminals moved during the time period between obtaining the initial location information (in the optional step prior to step **410**) and actually performing the measurements as instructed by the information collector **7**, and the new location of such a terminal is out of the location area for which the coverage assessment should be generated, the new location and the corresponding measurement may be either discarded or stored in the database **11**A for future use, but not used at the moment for the coverage assessment of the LTE network. In this case, the information collector **7** may be further configured to update the selected one or more terminals to eliminate terminals whose new location is not included in a predefined location area for which the coverage assessment should be generated.

The method then proceeds to step **440**, where the information collector **7** forwards the measurement information obtained from the selected terminals to the coverage estimator **8** within the LTE network. If the information collector **7** also has the location information for the selected terminals, then the information collector **7** may associate the received measurement information with the location information prior to forwarding the measurement information and the location information to the coverage estimator **8**.

The coverage estimator **8** is in charge of the coverage estimation of the LTE network (the second wireless access network **2**B in this example), with the measurement information and, optionally, location information received from the information collector **7**. Once the coverage estimator **8** obtains the measurement information (and, optionally, the location information) from the information collector **7**, then, in step **450**, the coverage estimator **8** generates the coverage assessment for the LTE network based on the information obtained from the information collector **7**. The coverage assessment is generated by assembling a coverage map, representing the geographic locations/pixels with associated signal strengths of the LTE network. The coverage estimator **8** may also be configured to instruct the information collector **7** with some specifications for measurement, for example where to measure, when to measure, how often to measure or which particular LTE cells to measure.

The measured results and corresponding location information may be stored in the database **11**A, and the estimated coverage results may be stored in the database **11**B, for future use. The historical data in the database **11**A may e.g. be used to make some statistical processing of the measured signal strengths in the same location/pixel or in a related set of locations/pixels. One example of such statistical processing is to determine an average or median value of the measured signal strengths in the considered location(s)/pixel(s) in order to mitigate the effect of fading of the LTE signal. Most advantageously, such statistical processing may determine an estimate of the degree of fading in the considered location(s)/pixel(s). It may determine, for example, an estimate for the standard deviation and/or an estimate of a low and high quantile value of the measured signal strengths in the considered location(s)/pixel(s). Also, the low quantile value may be used as an improved indicator of coverage in the considered location(s)/pixel(s) compared to an indicator based on an average or median value. Information about the severity of fading or information about a low quantile of the predicted signal strength is generally unavailable from coverage calculations based on models for the attenuation of radio signals. The historical data in the database **11**B may e.g. be used to compare the coverage map before and after deploying new base stations of the LTE network, to confirm whether the coverage of the LTE network has improved or not in some specific areas.

With some modifications, persons skilled in the art could extend the deployment of the coverage assessment system to other architectures, networks, and selection criteria than those described in FIGS. **2**-**4**.

Generating coverage assessment for one of the wireless access networks using results of the measurements collected at one of the other, cooperating, wireless access networks allows obtaining a more accurate and complete coverage assessment, relative to the prior art approaches. In addition, in contrast to the current coverage estimation methods, the proposed approach is able to account for the fact that a given wireless operator may operate multiple wireless access networks with non-identical coverage area (for example, one wireless access network may have an extensive, possibly near-complete, coverage area, while another wireless access network has a more limited, possibly discontinuous, coverage area).

Based on the generated coverage assessment, the coverage estimator **8** may further be configured to suggest geographical areas as candidates for coverage improvement. One or more of thus suggested geographical areas may be selected as an input to a separate planning procedure. The coverage estimator **8** may even further be configured to indicate whether, e.g. based on an established rule-of-thumb, the suggested area for improvement is sufficiently close to an existing base station location to be served from there, or that a new base station location needs to be found and, possibly in addition, in which area such a base station location preferably could be found. The coverage estimator **8** may be also configured to compare the current coverage assessment with a previously generated coverage assessment to determine whether the coverage optimization actions in the past have led to a coverage improvement, identify where the coverage improvement is most pronounced, and identify the remaining areas where further coverage improvement is still needed. The system and method for coverage assessment as described here can also be advantageously used to measure interfering signals, e.g. those generated by the second wireless access network. The mea-

sured interference values may be taken into account for the coverage assessment or be valued as such and taken into account as input to a planning procedure.

One embodiment of the invention may be implemented as a program product for use with a computer system. The program(s) of the program product define functions of the embodiments (including the methods described herein) and can be contained on a variety of computer-readable storage media. Illustrative computer-readable storage media include, but are not limited to: (i) non-writable storage media (e.g., read-only memory devices within a computer such as CD-ROM disks readable by a CD-ROM drive, flash memory, ROM chips or any type of solid-state non-volatile semiconductor memory) on which information is permanently stored; and (ii) writable storage media (e.g., floppy disks within a diskette drive or hard-disk drive or any type of solid-state random-access semiconductor memory) on which alterable information is stored.

While the forgoing is directed to embodiments of the present invention, other and further embodiments of the invention may be devised without departing from the basic scope thereof. Therefore, the scope of the present invention is determined by the claims that follow.

The invention claimed is:

1. An automatic coverage assessment system configured for generating a coverage assessment for a second wireless access network of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals, the system comprising:

an information collector; and

a coverage estimator,

wherein the information collector is configured to:

(i) select one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network,

(ii) instruct the selected one or more terminals to measure signals from the second wireless access network,

(iii) obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals, and

(iv) provide the measurement information to the coverage estimator, and wherein the coverage estimator is configured to:

(i) obtain the measurement information from the information collector, and

(ii) based on the obtained measurement information, generate the coverage assessment for the second wireless access network of the telecommunications infrastructure.

2. The automatic coverage assessment system of claim **1**, wherein the system further comprises a trigger configured for triggering the information collector to select the one or more terminals.

3. The automatic coverage assessment system of claim **1**, wherein the information collector is further configured to obtain location information for at least one of the at least part of the plurality of terminals prior to selecting the one or more terminals.

4. The automatic coverage assessment system of claim **3**, wherein the information collector is further configured to associate the location information with at least one of the selected one or more terminals and provide the location information associated with the at least one of the selected one or more terminals to the coverage estimator.

5. The automatic coverage assessment system of claim **1**, wherein the information collector is further configured to provide location information valid upon obtaining the measurement information for at least one of the selected one or more terminals.

6. An automatic coverage assessment method for generating a coverage assessment for a second wireless access network of a telecommunications infrastructure comprising a first wireless access network and the second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals, the method comprising:

(i) collecting, at an information collector, information from terminals by:

selecting one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network,

instructing the selected one or more terminals to measure signals from the second wireless access network,

obtaining measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals, and

providing the measurement information to a coverage estimator; and

(ii) generating, at the coverage estimator, the coverage assessment for the second wireless access network by:

obtaining the measurement information from the information collector, and

based on the obtained measurement information, generating the coverage assessment for the second wireless access network of the telecommunications infrastructure.

7. The automatic coverage assessment method of claim **6**, further comprising the step of triggering the information collector to select the one or more terminals.

8. The automatic coverage assessment method of claim **6**, further comprising the step of obtaining location information for at least one of the at least part of the plurality of terminals prior to selecting the one or more terminals.

9. The automatic coverage assessment method of claim **8**, further comprising the step of providing the location information valid upon obtaining the measurement information for at least one of the selected one or more terminals.

10. The automatic coverage assessment method of claim **8**, further comprising:

associating the location information with at least one of the selected one or more terminals, and

forwarding the location information associated with the at least one of the selected one or more terminals to the coverage estimator.

11. A mobile user terminal configured for use in the method of claim **6**, the terminal comprising:

means for measuring signals from the second wireless access network; and

means for providing the measurement information to at least one of the information collector and the coverage estimator based on the measured signals.

12. A computer program comprising software code portions configured for, when executed by a processor, performing one or more steps of the method of claim **6**.

13. A network node for use in a telecommunications infrastructure comprising a first wireless access network and a second wireless access network, the first and second wireless

access networks capable of providing services to a plurality of terminals, the node comprising:

means for selecting one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network;

means for instructing the selected one or more terminals to measure signals from the second wireless access network,

means for obtaining measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals; and

means for providing the measurement information to a coverage estimator,

wherein the coverage estimator is configured to generate the coverage assessment for the second wireless access network of the telecommunications infrastructure based on the measurement information provided by the network node.

14. The network node of claim **13**, wherein the coverage estimator is included within the network node.

15. A network node for use in a telecommunications infrastructure comprising a first wireless access network and a second wireless access network, the first and second wireless access networks capable of providing services to a plurality of terminals, the node comprising:

means for obtaining measurement information from an information collector; and

means for generating the coverage assessment for the second wireless access network of the telecommunications infrastructure based on the obtained measurement information,

wherein the information collector is configured to:

(i) select one or more terminals from at least part of the plurality of the terminals, the at least part of the plurality of the terminals capable of communicating with both the first wireless access network and the second wireless access network,

(ii) instruct the selected one or more terminals to measure signals from the second wireless access network,

(iii) obtain measurement information indicative of the signals measured from the second wireless access network by the selected one or more terminals, and

(iv) provide the measurement information to the network node.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.	: 8,626,175 B2
APPLICATION NO.	: 13/516905
DATED	: January 7, 2014
INVENTOR(S)	: Jorguseski et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the title page, item (75) inventors,

delete "Victor Pais" and replace it with:

-- Adrian Victor Pais --.

Signed and Sealed this
Twenty-eighth Day of July, 2015

Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office

PTO/AIA/53 (09-12)
Approved for use through 01/31/2020 OMB 0651-0033
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

REISSUE APPLICATION: CONSENT OF ASSIGNEE; STATEMENT OF NON-ASSIGNMENT	Docket Number (Optional) 12-678-REI

This is part of the application for a reissue patent based on the original patent identified below.

Name of Patentee(s)
Koninklijke KPN N.V.

Patent Number	Date Patent Issued
8,626,175	January 7, 2014

Title of Invention
Method and System for Automatic Coverage Assessment for Cooperating Wireless Access Networks

1. [X] Filed herein is a statement under 37 CFR 3.73(c). (Form PTO/AIA/96)

2. [ ] Ownership of the patent is in the inventor(s), and no assignment of the patent is in effect.

One of boxes 1 or 2 above must be checked. If multiple assignees, complete this form for each assignee. If box 2 is checked, skip the next entry and go directly to "Name of Assignee."

The written consent of all assignees and inventors owning an undivided interest in the original patent is included in this application for reissue.

The assignee(s) owning an undivided interest in said original patent is/are Koninklijke KPN N.V., and the assignee(s) consents to the accompanying application for reissue.

Name of assignee/inventor (if not assigned)
Koninklijke KPN N.V.

Signature	Date
	13-12-2018

Typed or printed name and title of person signing for assignee (if assigned)

Koenraad Wuyts, Corporate Intellectual Property Officer, KPN

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.