

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P71957WO1	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/SE2018/050456	International filing date (day/month/year) 03.05.2018	Priority date (day/month/year) 04.05.2017	
International Patent Classification (IPC) or national classification and IPC INV. H04W16/28			
Applicant Telefonaktiebolaget LM Ericsson (publ)			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>7</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ (sent to the applicant and to the International Bureau) a total of <u>6</u> sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)). b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions).			
4. This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☐ 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 conclusion under Article 35(2) with regard to novelty, inventive step or 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			
Date of submission of the demand 01.03.2019		Date of completion of this report 19.08.2019	
Name and mailing address of the international preliminary examining authority:  European Patent Office Gitschiner Str. 103 D-10958 Berlin Tel. +49 30 25901 - 0 Fax: +49 30 25901 - 840		Authorized officer Alonso Maleta, J Telephone No. +49 30 25901-487	



INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/SE2018/050456

Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ 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 (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a) and (b))
2. With regard to the **elements*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1-34 as originally filed

Claims, Numbers

1-20 filed in electronic form on 15-05-2019

Drawings, Sheets

1/22-22/22 as originally filed

- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
 - ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(e)).

**INTERNATIONAL PRELIMINARY REPORT
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International application No.
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6. ☒ With regard to top-up searches (Rules 66.1 *ter* and 70.2(f)):
- ☒ A top-up search was carried out by this Authority on 11.07.2019 (all discovered documents are listed in the Supplemental Box Relating to Top-up Search).
 - ☐ Additional relevant documents have been discovered during the top-up search.
 - ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded".

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-20</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-20</u>
Industrial applicability (IA)	Yes: Claims	<u>1-20</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V.

1 Reference is made to the following documents:

- D1 ASUSTEK: "Consideration on measurement reporting for NR mobility",
3GPP DRAFT; R2-1701446 CONSIDERATION ON MEASUREMENT REPORTING FOR NR MOBILITY, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS
,
vol. RAN WG2, no. Athens, Greece; 20170213 - 20170217 12 February 2017 (2017-02-12), XP051212084,
Retrieved from the Internet:
URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN2/Docs/
[retrieved on 2017-02-12]
- D2 SONY: "Cell quality measurement evaluation using multiple beams (Was R2-1700141)",
3GPP DRAFT; R2-1701504 NR CELL QUALITY BEAMS, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE
,
vol. RAN WG2, no. Athens, Greece; 20170213 - 20170217 12 February 2017 (2017-02-12), XP051212134,
Retrieved from the Internet:
URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN2/Docs/
[retrieved on 2017-02-12]

2 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-20 does not involve an inventive step in the sense of Article 33(3) PCT.

2.1 Using the wording of independent claim 1, document D1, which is regarded as being the closest prior art, discloses (the references in parenthesis applying to this document):

"A method performed by a wireless device for handling communication of the wireless device in a wireless communication network, wherein a radio network node serves the wireless device, the method comprising:

- *obtaining* a first indication indicating a first number of beams for performing cell quality derivation (section "1. Introduction": lines 6-11) on and a second indication indicating a second number of beams for performing measurement reporting on (page 1, last paragraph; page 2, first paragraph; page 3: "Proposal 1");
- *performing* a cell quality derivation taking the first indication into account (page 2, last paragraph; page 3, lines 5-8); and
- *performing* measurement reporting of the second number of beams taking the second indication into account (page 2, first and last paragraphs; pages 3-4: "Proposal 2")."

D1 discloses that the quality can be derived based on:

- a) best beam
- b) N best beams
- c) all detected beams
- d) beams above a threshold

and additionally discloses that the UE can be configured to provide in a measurement report:

- measurement result of the best beam of a cell
- average of measurement results of multiple beams of a cell
- measurement result of individual beam of a cell
- number of usable beams of a cell.

The subject-matter of claim 1 therefore differs from this known method in that the first and the second numbers are different and the first number is lower than the second number.

Although D1 does not explicitly disclose that the first and the second numbers are different and that the first number is lower than the second number, D1 discloses that the quality can be derived based on:

- a) best beam
- b) N best beams
- c) all detected beams
- d) beams above a threshold

and additionally discloses that the UE can be configured to provide in a measurement report:

- measurement result of the best beam of a cell
- average of measurement results of multiple beams of a cell
- summation of measurement results of multiple beams of a cell
- measurement result of individual beam of a cell
- number of usable beams of a cell.

The first number indicates a number of beams to derive a cell quality and the second number indicates a number for performing measurement reporting. The examining authority is of the opinion that there is no hint in D1 that suggests that both numbers should be equal and on the contrary, as both numbers are related to two different features, i.e.: reporting a derived quality and reporting measurements of detected beams to discover a potential better beam, the feature of defining two different numbers being one lower than the other is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in view of the possible combinations of choosing both numbers from the disclosure of D1.

In addition, the examination authority is of the opinion that the feature of choosing a first and a second number which are different and the first number being lower than the second number does not solve the problem of avoiding the occurrences of handover failures and/or radio link failures.

As disclosed in page 8, line 30-page 9, line 9 of the description, the problem of avoiding the occurrences of handover failures and/or radio link failures is solved by the feature of deriving a quality of the serving cell averaging N instead of using the best beam.

Independent claims 8, 9 and 16-20 define the equivalent features in terms of a method performed by a radio network node, wireless devices, radio network nodes, a computer program product and a computer-readable storage medium to the corresponding method defined in claim 1.

The feature of claims 8, 16 and 20 that the radio network node transmits also an indication of the first number of beams is considered as a merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to solve the problem of how to configure the wireless device to report

measurements (see i.e. page 2, last paragraph: "how to determine cell quality should be decided by the network; the UE should provide information based on network need"; page 3, paragraph after Table 1).

Therefore, the subject-matter of independent claims 1, 8, 9 and 16-20 does not involve an inventive step in the sense of Article 33(3) PCT.

- 2.2 The additional features of dependent claims 3, 4, 6, 11, 12 and 14 are already known from document D1 (see section "1 Introduction": lines 8-9; pages 3-4: "Proposal 2").
- 2.3 Features of dependent claims 2, 5, 7, 10, 13 and 15 are merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill.

Re Item VIII.

- 3 The application does not meet the requirements of Article 6 PCT, because claims 1, 9, 16, 19 and 20 are not clear.
 - 3.1 The statement "performing a cell quality derivation taking the first indication into account" used in claims 1, 9 and 19 is vague and unclear and leaves the reader in doubt as to how the cell quality derivation is used and the relationship, if any, with the measurement reporting, thereby rendering the definition of the subject-matter of said claims unclear, Article 6 PCT.
 - 3.2 Although claims 9 and 19; and claims 16 and 20 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought or in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.

Via CMS (epoline Case Management System)

European Patent Office
80298 Munich
GERMANY**Response to 2nd Written Opinion**

Application Number: PCT/SE2018/050456
Application Date: 2018-05-03
Applicant: Telefonaktiebolaget LM Ericsson (publ)
Our Reference: P71957 WO1

Enclosure(s):

Claims: Amended claims (clean)
Marked up claim amendments for information purpose

Dear Sirs,
In response to the 2nd WO we submit an amended set of claims 1-20 with the following remarks.

AMENDMENTS

Main claims have been amended by adding that the first number is lower than the second number. Support is found on page 12 line 6-8 wherein it is stated that cell quality derivation could be triggered on the first number of beams e.g. best beam ($N1=1$) and the reporting configuration based on the second number of beams such as $N2>1$. Thus, the first number is lower than the second number.

Thus, the amendments are supported in the original application.

NOVELTY AND INVENTIVE STEP

D1 discloses a written discussion regarding what should be comprised in a measurement report e.g. a single best beam measurement or an average result of measurement results of a number of beams.

The claimed solution relates to a wireless device that determines cell quality of a first number of beams and performs measurement reporting of a second number of beams, wherein the first and second numbers are different and the first number is lower than the second number. Thus, the wireless device can avoid the triggering of late measurement reports (e.g. by setting the first indication, such as $N1$, equal to one) and consequently avoid the occurrences of handover failures and/or radio link failures. And, at the same time, the wireless device may provide more detailed beam-level information to the first radio network node about the beams from neighbour cells (e.g. setting the second indication, such as $N2$, more than 1). In other words, cell quality derivation could be triggered on the first number of beams e.g. best beam ($N1=1$) and the reporting configuration based on the second number of beams such as $N2>1$. Hence, embodiments herein improve the performance of the wireless communication network.

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None of the cited documents shows this decoupled different number of beams wherein the first number is lower than the second number. D1 merely shows the advantages and disadvantages of using a single beam and e.g. average of multiple beams. This is not what is claimed. What is claimed is that the wireless device obtains a first and a second number of beams for different purposes wherein the first number is lower than the second number. Thus, the wireless device avoids the triggering of late measurement reports and consequently the occurrences of handover failures and/or radio link failures. And, at the same time, the wireless device may provide more detailed beam-level information to the first radio network node about the beams from neighbour cells.

Especially, there is nothing in D1 that discloses a wireless device that obtains a first indication indicating a first number and obtains a second indication indicating a second number, wherein the first and second numbers are different and that the first number is lower than the second number.

The skilled person is not in D1 hinted nor directed towards a solution as claimed. It is merely mentioned that it is for further study to decide on what beams to perform the different measurements. It is nowhere stated a manner to avoid the triggering of late measurement reports and consequently the occurrences of handover failures and/or radio link failures. And, at the same time, provide more detailed beam-level information to the first radio network node about the beams from neighbour cells. Thus, the skilled person has no incentive to use a first number that is lower than the second number as claimed neither from what is stated in D1, D2 or a combination of the cited documents. Hence, the claimed solution is novel and inventive over cited prior art.

The dependent claims 2-7, and 10-15 are dependent on claims 1, and 9, respectively, and are therefore novel and inventive as well, at least due to their dependency from the independent claims.

We postpone amending the description until the national phase.

Based on the above, it is respectfully requested to a positive IPRP on the basis of the amended claims. Should the examiner for any reason consider a negative report a new Communication or a telephone discussion is respectfully requested.

Sincerely, for the Applicant

/Nabil Ayoub/
ERICSSON AB
Patent Unit Kista RAN2

CLAIMS

1. A method performed by a wireless device (10) for handling communication of the wireless device (10) in a wireless communication network (1), wherein a radio network node (12) serves the wireless device (10), the method comprising:
 - *obtaining* (1011) a first indication indicating a first number of beams for performing cell quality derivation on and a second indication indicating a second number of beams for performing measurement reporting on, wherein the first and second numbers are different and the first number is lower than the second number;
 - *performing* (1014) a cell quality derivation taking the first indication into account;and
 - *performing* (1015) measurement reporting of the second number of beams taking the second indication into account.
2. The method according to claim 1, wherein, obtaining the first indication comprises assuming the first indication to indicate that the first number of beam is one when no indication is received by the wireless device, or when only receiving the second indication from the radio network node.
3. The method according to any of the claims 1-2, wherein the first and/or the second indication is a real value defining the number of beams and/or a threshold value defining best beams.
4. The method according to any of the claims 1-3, wherein the first indication indicates that the first number of beams is one.
5. The method according to any of the claims 1-4, comprising, if the first number of beams for cell quality derivation is lower than the second number of beams for measurement reporting, setting up (1013) a maximum number of filters, and performing (1014) cell quality derivation using a subset of values for cell quality derivation while including all available filtered values in the measurement reports.
6. The method according to any of the claims 1-5, wherein numbers of beams configured by the radio network node to be used by the wireless device for cell quality derivation and measurement reporting are interpreted as the maximum number of beams to be averaged to compute cell quality derivation.

7. The method according to any of the claims 1-6, wherein the first indication is a function using the second indication.
8. A method performed by a radio network node (12) for handling communication of a wireless device in a wireless communication network, wherein the radio network node serves the wireless device, the method comprising
 - *transmitting* (1021) configuration data to the wireless device (10), wherein the configuration data comprises a first indication indicating a first number of beams for performing cell quality derivation on and a second indication indicating a second number of beams for performing measurement reporting on, wherein the first and second numbers are different and the first number is lower than the second number.
9. A wireless device (10) for handling communication of the wireless device (10) in a wireless communication network (1), wherein a radio network node (12) is configured to serve the wireless device (10) and the wireless device is configured to:
 - obtain a first indication indicating a first number of beams for performing cell quality derivation on and a second indication indicating a second number of beams for performing measurement reporting on, wherein the first and second numbers are different and the first number is lower than the second number;
 - perform a cell quality derivation taking the first indication into account; and to
 - perform a measurement reporting of the second number of beams taking the second indication into account.
10. The wireless device (10) according to claim 9, wherein the wireless device is configured to obtain the first indication by assuming the first indication to indicate that the first number of beam is one when no indication is received by the wireless device, or when only receiving the second indication from the radio network node.
11. The wireless device (10) according to any of the claims 9-10, wherein the first and/or the second indication is a real value defining the number of beams and/or a threshold value defining best beams.
12. The wireless device (10) according to any of the claims 9-11, wherein the first indication indicates that the first number of beams is one.

13. The wireless device (10) according to any of the claims 9-12, further being configured to, when the first number of beams for cell quality derivation is lower than the second number of beams for measurement reporting, set up a maximum number of filters, and to perform the cell quality derivation using a subset of values for cell quality derivation while including all available filtered values in the measurement reports.

14. The wireless device (10) according to any of the claims 9-13, configured to interpret the numbers of beams configured by the radio network node to be used by the wireless device for cell quality derivation and measurement reporting as the maximum number of beams to be averaged to compute cell quality derivation.

15. The wireless device (10) according to any of the claims 9-14, wherein the first indication is a function using the second indication.

16. A radio network node (12) for handling communication of a wireless device in a wireless communication network, wherein the radio network node is configured to serve the wireless device, and to:

transmit configuration data to the wireless device, wherein the configuration data comprises a first indication indicating a first number of beams for performing cell quality derivation on and a second indication indicating a second number of beams for performing measurement reporting on, wherein the first and second numbers are different and the first number is lower than the second number.

17. A computer program product comprising instructions, which, when executed on at least one processor, causes the at least one processor to carry out the method according to any of the claims 1-8, as performed by the radio network node or the wireless device.

18. A computer-readable storage medium, having stored thereon a computer program product comprising instructions which, when executed on at least one processor, cause the at least one processor to carry out the method according to any of the claims 1-8, as performed by the radio network node or the wireless device.

19. A wireless device (10) comprising processing circuitry configured to:
obtain a first indication indicating a first number of beams for performing cell quality derivation on and a second indication indicating a second number of

beams for performing measurement reporting on, wherein the first and second numbers are different and the first number is lower than the second number;
perform a cell quality derivation taking the first indication into account; and to
perform a measurement reporting of the second number of beams taking the second indication into account.

20. A radio network node (12) comprising processing circuitry configured to:

transmit configuration data to the wireless device, wherein the configuration data comprises a first indication indicating a first number of beams for performing cell quality derivation on and a second indication indicating a second number of beams for performing measurement reporting on, wherein the first and second numbers are different and the first number is lower than the second number.