

FIGURA 1

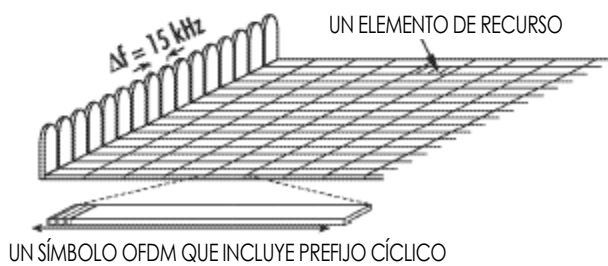


FIGURA 2

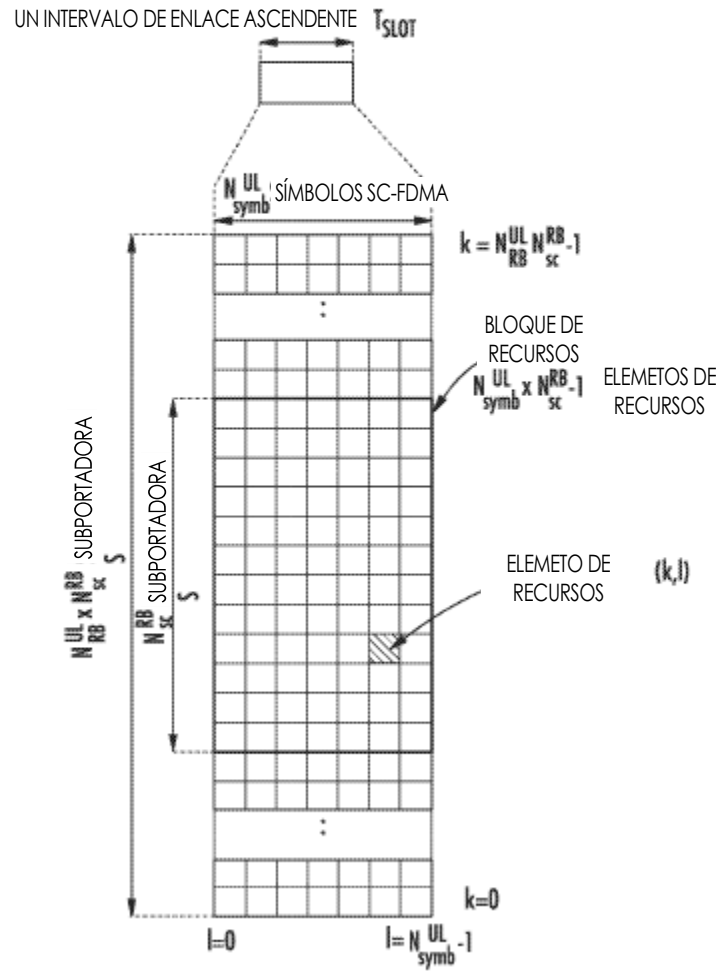


FIGURA 3

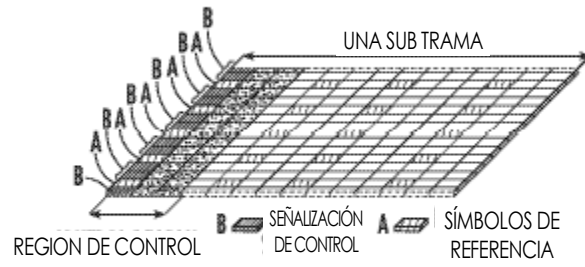


FIGURA 4

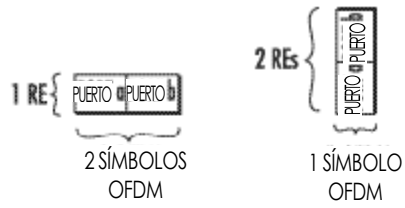


FIGURA 5

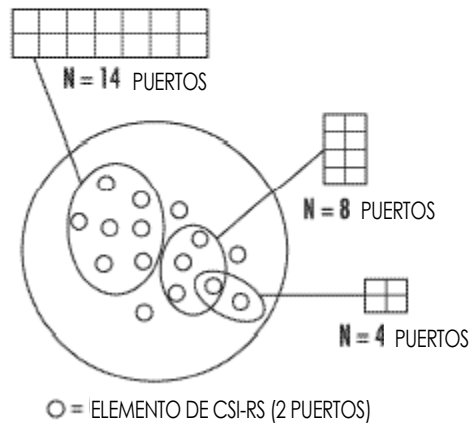


FIGURA 6

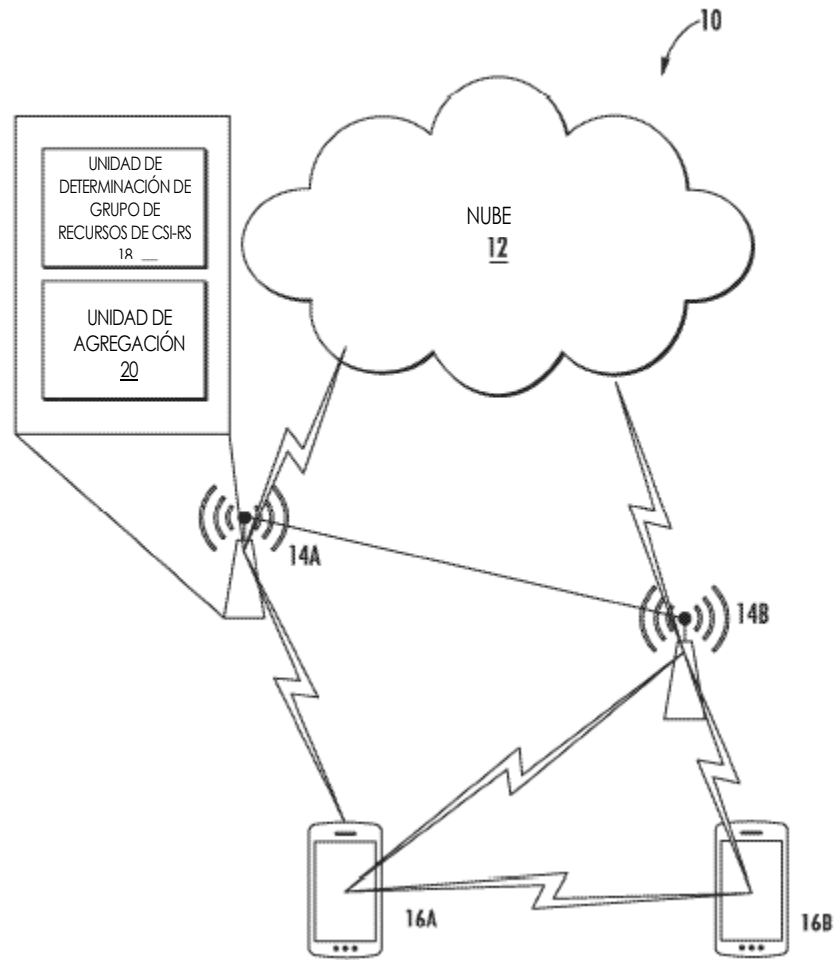


FIGURA 7

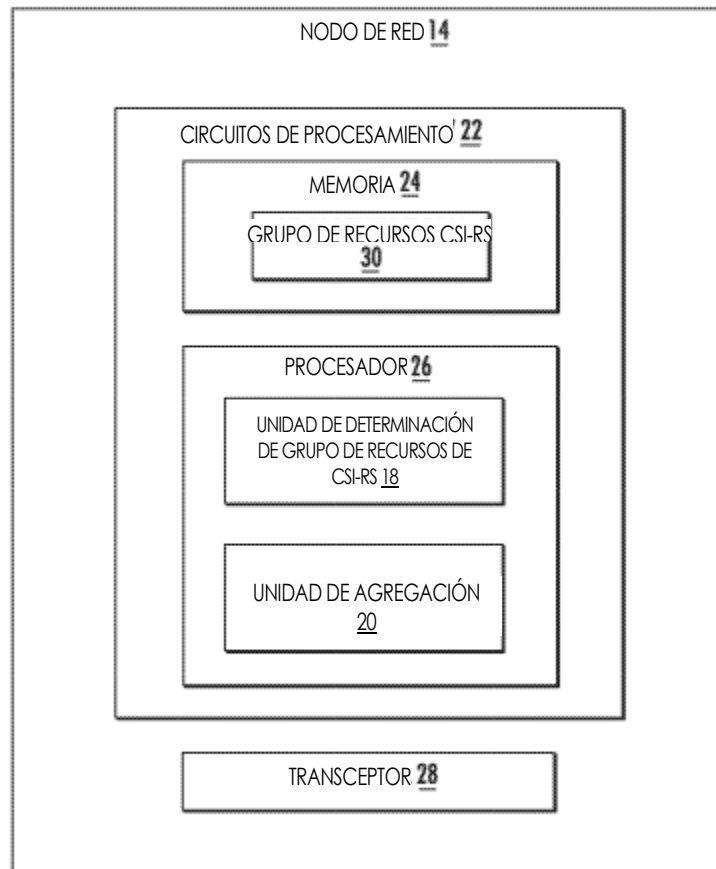


FIGURA 8

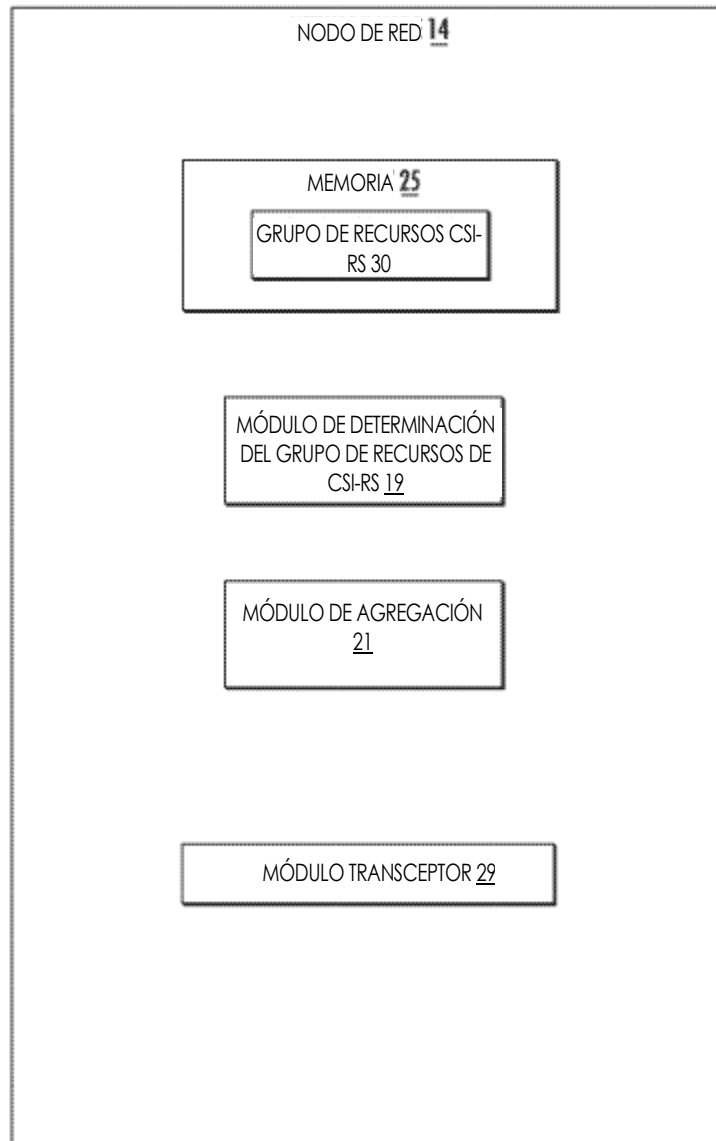


FIGURA 9

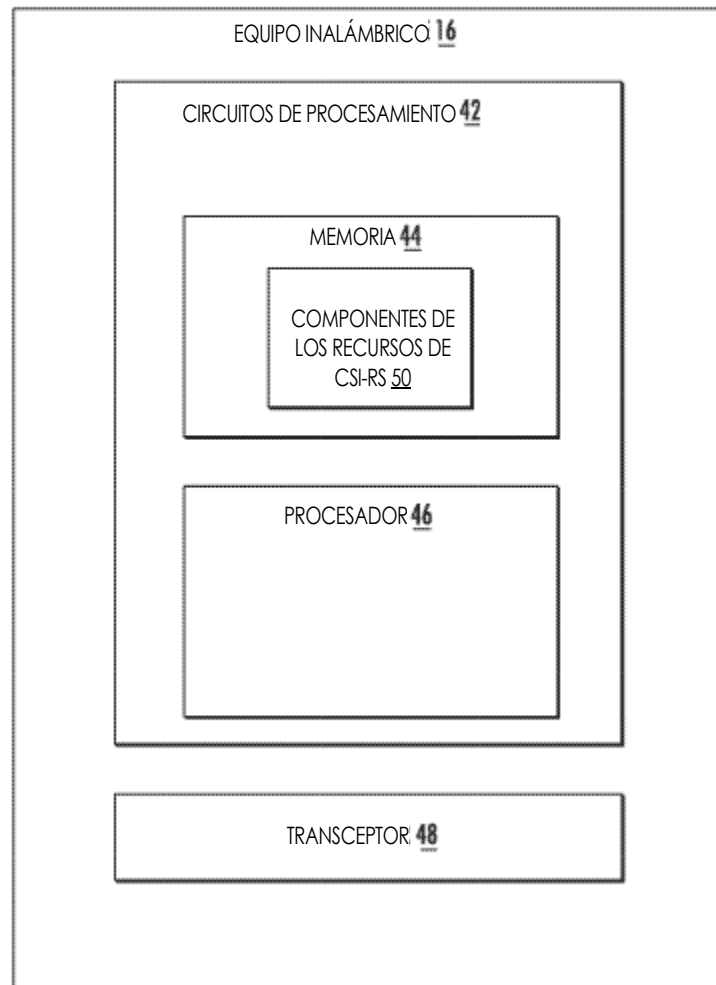


FIGURA 10

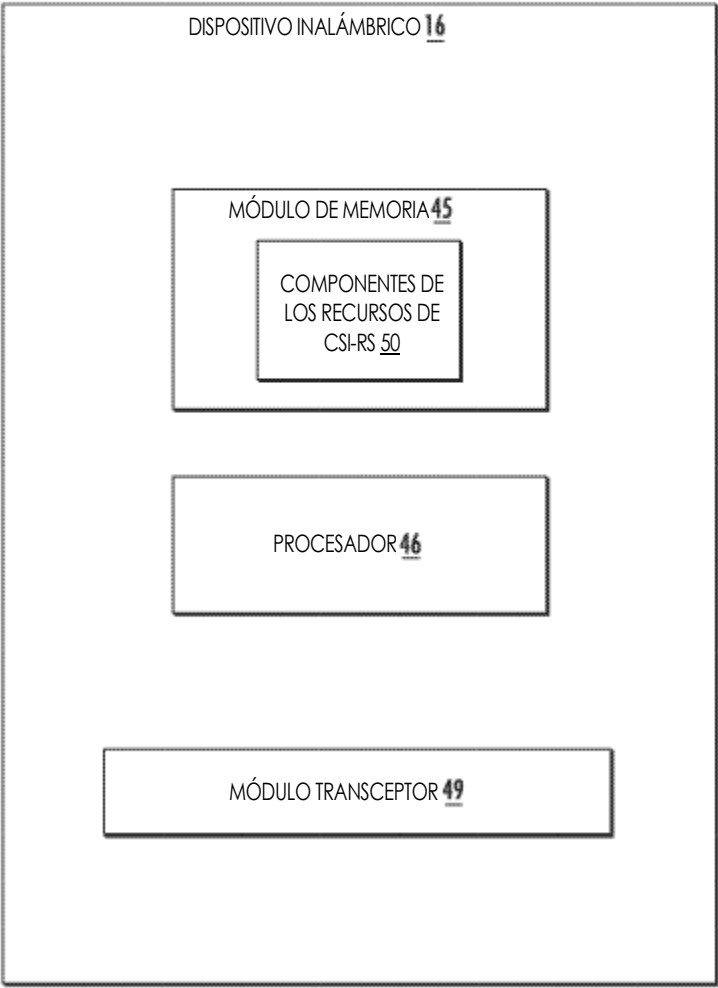
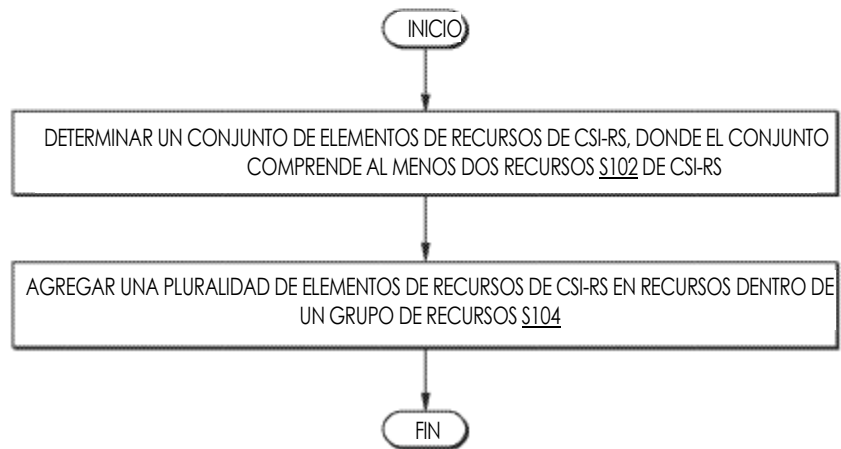
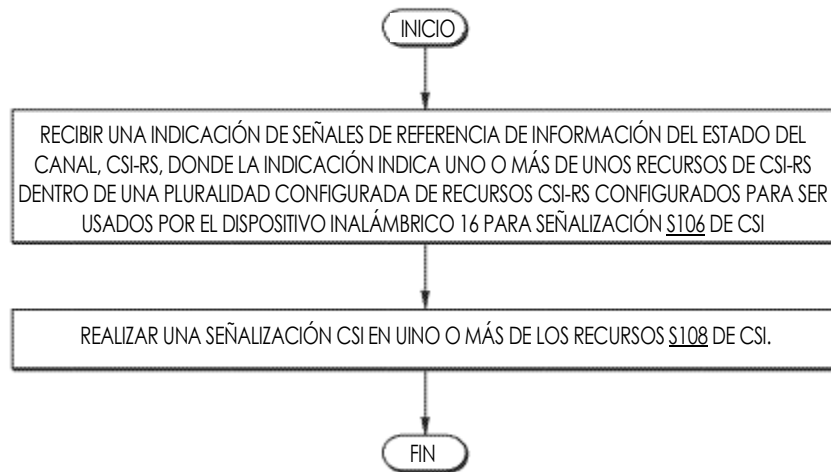


FIGURA 11

**FIGURA 12****FIGURA 13**

**FIGURA 14**

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 1557-410PWO	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/IB2017/056044	International filing date (<i>day/month/year</i>) 29.09.2017	Priority date (<i>day/month/year</i>) 30.09.2016	
International Patent Classification (IPC) or national classification and IPC INV. H04L5/00			
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>8</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ (<i>sent to the applicant and to the International Bureau</i>) a total of <u>18</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. ☐ (<i>sent to the International Bureau only</i>) 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 statement 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 27.07.2018		Date of completion of this report 13.02.2019	
Name and mailing address of the international preliminary examining authority:  European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016		Authorized officer Skraparlis, D Telephone No. +31 70 340-4793	



INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/IB2017/056044

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

1-23 as originally filed

Claims, Numbers

1-49 filed with telefax on 30-08-2018

Drawings, Sheets

1/10-10/10 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. 3,13
 - ☐ 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. 1,11,21,37,40,43-45,48,49
 - ☐ 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)).

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 24.09.2018 (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. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:
- ☐ the entire international application,
 - ☒ claims Nos. 22-36, 46, 47
- because:
- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
 - ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
 - ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*).
 - ☒ no international search report has been established for the said claims Nos. 22-36, 46, 47
 - ☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:
 - ☐ furnish a sequence listing in the form of an Annex C/ST.25 text file, and such listing was not available to the International Preliminary Examining Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.
 - ☐ furnish a sequence listing on paper or in the form of an image file complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Preliminary Examining Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.
 - ☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13*ter*.1(a) or (b) and 13*ter*.2.
 - ☒ See separate sheet for further details

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>2, 4-10, 12, 14-20, 38, 39, 41, 42</u>
	No: Claims	<u>1, 11, 21, 37, 40, 43-45, 48, 49</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1, 2, 4-12, 14-21, 37-45, 48, 49</u>
Industrial applicability (IA)	Yes: Claims	<u>1-21, 37-45, 48, 49</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

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 I

- 1 The term "dynamically" in the feature of "transmitting..an indication of..CSI RS,resources, the indication indicating..within a configured plurality of CSI-RS resources" of claim 1 does not have a basis in the application as originally filed and therefore introduces subject-matter which extends beyond the content of the application as filed, contrary to A. 34(2)(b) PCT.

According to the description (p. 11, l. 24-29), the word "dynamically" is used to refer to the *configuring* of resources ("the one or more resources are dynamically configured in a single step") and not to "*transmitting .. an indication*" of resources "within" an *(already) "configured plurality of .. resources"*, see claim 1, l. 2-4.

A similar objection also applies mutatis-mutandis to corresponding independent claims 11,21,37,40,43-45,48,49.

The present claim set therefore extends beyond the content of the application as filed and as a result is contrary to A. 34(2)(b) PCT and only the combination of the technical features which have a basis in the application as originally filed are considered.

Re Item III

- 2 Claims 22-36,46,47 for which no search fees were paid will not be objected or commented on, see PCT GL.C-V.1.

Re Item V

Reference is made to the following documents:

- D1 QUALCOMM INCORPORATED: "Enhancements on Beamformed CSI-RS", 3GPP DRAFT; R1-166270, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. Gothenburg, Sweden; 20160822 - 20160826 21 August 2016 (2016-08-21), XP051125310, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/ [retrieved on 2016-08-21]

- D2 WO 2011/100520 A1 (RESEARCH IN MOTION LTD [CA]; FONG MO-HAN [CA]; YU DONGSHENG [CA]; XU H) 18 August 2011 (2011-08-18)
- D3 ALCATEL-LUCENT SHANGHAI BELL ET AL: "Remaining Issues of QCL and MR", 3GPP DRAFT; R1-156713 REMAINING ISSUES OF QCL AND MR_FINAL, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. Anaheim, US; 20151115 - 20151122 15 November 2015 (2015-11-15), XP051039918, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/ [retrieved on 2015-11-15]

As detailed in Re Item I above, only the combination of technical features which have a basis in the application as originally filed are considered, as follows:

- 3 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.
- 3.1 It is noted that the features of claim 1 related to scheduling/indicating one or more CSI-RS resources within a configured plurality of CSI-RS resources for channel state information signaling, measurement and reporting from one or more wireless devices are well-known in the art as they are typical inherent features of every network node and wireless device in wireless communications.
- 3.2 Furthermore, document D1 discloses (the references in parentheses applying to this document):
- A method at a network node, the method comprising:
transmitting to a wireless device an indication of channel state information reference signals, CSI-RS, resources, the indication indicating one or more than one CSI-RS resources within a configured plurality of CSI-RS resources configured to be used by the wireless device for CSI signaling. **(Section 2, par. below "Observation 1": indicating/triggering of a CSI-RS resource from a preconfigured plurality of CSI-RS resources/"resource pool" is disclosed)**

- 4 The same reasoning of the previous section applies, *mutatis mutandis*, to the subject-matter of the corresponding independent claims 11, 21, 37, 40, 43-45, 48, 49, the subject-matter of which therefore is also considered not new.
- 5 Dependent claims 2,4-10 and corresponding dependent claims 12,14-20, 38,39, 41,42 do not appear to contain any features which, in combination with the features of any claim to which they refer, meet the criteria of Article 33(1) PCT in respect of inventive step in the sense of Article 33(3) PCT. The subject-matter of said claims is related to mere design options and implementation details which come within the scope of the customary practice followed by persons skilled in the art of CSI-RS allocation and scheduling and CSI/CQI measurements and reporting, see any one of documents D1 or D2 or D3 (see references to each document cited in the Search Report), especially as the advantages thus achieved can be readily contemplated in advance.

Re Item VII

- 6 The independent claims are not in the two-part form in accordance with Rule 6.3(b) PCT.
- 7 The features of the claims should be provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
- 8 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents cited in the Search Report is not mentioned in the description, nor are these documents identified therein.

Re Item VIII

- 9 The application does not meet the requirements of Article 6 PCT for the following reasons:
- 9.1 Claim 1 is not supported by the description as required by Article 6 PCT, as its scope is broader than justified by the description and drawings. The subject-matter of claim 1 generally refers to CSI-RS scheduling which is a well known feature of every network node and wireless device in wireless

communications, contrary to the description which discusses multiple cases of more specific CSI-RS configurations which address more specific problems to be solved than the enabling of generic CSI measurements and reporting.

- 9.2 The term "different aggregations of resource elements" used in claim 8 is vague and unclear because it is not clear to which operations on the resource elements it refers to and on how such operations may differ from each other.
- 9.3 Although claims 49, 43, 40 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 and/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.
- 9.4 Although claims 44, 1 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 and/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.
- 9.5 Although claims 45, 21, 11 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 and/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.
- 9.6 Although claims 48, 37 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 and/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.
- 9.7 The vague and imprecise statement "...the embodiments described herein are not limited to what has been particularly shown..." in the description on p. 23, l. 3, 4 implies that the subject-matter for which protection is sought may be different to that defined by the claims, thereby resulting in lack of clarity (Article 6 PCT) when used to interpret them.

IN THE EUROPEAN PATENT OFFICE

AS

INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

International Application Serial No: PCT/IB2017/056044

International Filing Date: 29 September 2017

Applicant: TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)

Title: APERIODIC CSI AND CSI-RS RESOURCE POOLING

Our File No.: 1557-410PWO (P51346 WO1)

VIA FACSIMILE ONLY to: 011-31-70-340-3016

D. Skraparlis
The European Patent Office
P.B. 5818
Patentlaan 2
NL-2280 HV Rijswijk

LETTER ACCOMPANYING AMENDMENT UNDER ARTICLE 34

Dear D. Skraparlis:

This letter is responsive to the Written Opinion dated 15 March 2018. A Demand with a one-month Extension of Time was filed via facsimile on 27 July 2018, thereby extending the time limit to 30 August 2018 to file Amendments Under Article 34 in connection with the subject Application.

International Application Serial No: PCT/IB2017/056044

International Filing Date: 29 September 2017

Applicant: Telefonaktiebolaget LM Ericsson (Publ)

Attorney Docket No: 1557-410PWO (P51346_WO1)

LACK OF UNITY OF INVENTION**Item IV**

The Written Opinion of the International Searching Authority, Item IV, states that the Application does not meet the requirements of unity of invention, as required by Rule 13.1 PCT. Only Claims 1-21, 37-45, 48 and 49 have been examined. Applicant does not concede that that claims lack unity of invention.

STATEMENT CONCERNING THE CLAIMS**Amendments to the Claims**

Independent Claims 1, 11, 21, 37, 40, 43-45, 48 and 49 have been amended to recite that the indication of channel state information reference signals (CSI-RS) is transmitted or received *dynamically*. Support for the claim amendments can be found in Applicant's specification at least at page 11, lines 24-29. Claims 3 and 13 have been cancelled without prejudice or disclaimer of subject matter. A Claim Sheet showing the amended marked-up claims is provided herewith as Appendix A.

Item V

The Written Opinion of the International Searching Authority, Item V, states that Claims 1, 11, 21, 37, 40, 43-45, 48 and 49 are allegedly not new under Article 33(2) PCT and that all claims allegedly lack an inventive step under Article 33(3) PCT in view of the following references:

- D1 Qualcomm Incorporated: "Enhancements on Beamformed CSI-RS", 3GPP Draft; R1-166270, 3rd Generation Partnership Project, Mobile Competence Centre [FR]
- D2 Research In Motion Ltd. "Reference Signal For a Coordinated Multi-Point Network Implementation" WO 2011/100520 A1 [CA]
- D3 Alcatel-Lucent Shanghai Bell *et al.* "Remaining Issues of QCL and MR", 3GPP Draft; R1-156713

Applicant respectfully traverses the rejections.

International Application Serial No: PCT/IB2017/056044

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Attorney Docket No: 1557-410PWO (P51346_WO1)

The claims are directed to dynamically sending to a wireless device an indication of CSI-RS. The indication of CSI-RS indicates one or more CSI-RS configured to be used by the wireless device for CSI signaling. As explained in Applicant's specification at pages 10 and 11, in Long Term Evolution (LTE), in a first step, users are pre-configured with a pool of CSI-RS resources which can be used for measurements. This pool is generic in the sense that these resources can subsequently be used to perform measurements in any beam and for any wireless device, hence the term "pool". In a second step, a subset of the resources from the pool is activated/released dynamically for a given wireless device through either downlink control information (DCI) or medium access control element (MAC CE) signaling. Finally, in a third step, one out of the subset of resources is dynamically indicated to the wireless device through DCI signaling. According to some of Applicant's embodiments, the second step set forth above is omitted, and an indication of CSI-RS resources is dynamically sent to the wireless device. Thus, rather than restricting the wireless device to measure and report CSI on only one out of the subset of CSI-RS resources in the third step mentioned above, some of Applicant's embodiments enable measurement and/or reporting on two or more resources as well. This functionality may be useful, for example, in beam management where a wireless device needs to measure signal strength on multiple beams, e.g., in a beam sweep operation. The intermediate second step therefore, may not be necessary; dynamic indication of the subset of resources on which the wireless device measures can be done dynamically in a single step.

The Written Opinion asserts that the independent claims of the present Application allegedly fail to recite subject matter that is considered new. Applicant respectfully traverses these objections.

Independent Claims 1, 11, 21, 37, 40, 43-45, 48 and 49

Amended Claim 1 recites "dynamically transmitting to a wireless device (16) an indication of channel state information reference signals, CSI-RS, resources, the indication indicating one or more than one CSI-RS resources within a configured plurality of CSI-RS resources configured to be used by the wireless device for CSI signaling (S100)." The remaining independent claims recite similar features. These features are not disclosed or suggested by D1.

D1 describes enhancements on beam-formed CSI-RS for eFD-MIMO. In particular, the Written Opinion points to the following paragraph of D1 (emphasis added):

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International Filing Date: 29 September 2017

Applicant: Telefonaktiebolaget LM Ericsson (Publ)

Attorney Docket No: 1557-410PWO (P51346_WO1)

“Scheme 2 proposes a mechanism for dynamic activation/deactivation of CSI-RS transmission. Compared to scheme 1, the CSI-RS transmission is not one-shot but multi-shot using a preconfigured semi-persistent CSI-RS resource. The transmission is based on a dynamic trigger command which may select **one** semi-persistent CSI-RS resources from the preconfigured CSI-RS resource pool. Multiple CSI-RS resource configurations in the pool may have different configuration of number of CSI-RS ports, time/frequency locations, etc. The CSI-RS resource pool can be shared by multiple UEs and the CSI-RS resource utilization efficiency is thus improved by dynamically activating different CSI-RS resources for the UE based on the activity level and possible collision. In other words, the CSI-RS resource is dynamically shared among multiple UEs with a maximum resource utilization. Each of scheme 1 and scheme 2 may have a different level on controlling the CSI-RS overhead. Scheme 1 is on the subframe level, and scheme 2 is on a relatively longer periodicity.”

Thus, D1 discloses “select[ing] one semi-persistent CSI-RS resources from the preconfigured CSI-RS resource pool.” D1 does not disclose or suggest at least the limitation of “indicating one or more than one CSI-RS resources within a configured plurality of CSI-RS resources,” as recited in amended Claim 1. Further, D1 discloses “dynamically *activating* different CSI-RS resources for the UE”. [emphasis added]. D1 does not disclose or suggest at least the limitation of “dynamically *transmitting* to a wireless device (16) an indication of channel state information reference signals, CSI-RS, resources” as recited in amended Claim 1. [emphasis added]. Activating CSI-RS resources is not the same as transmitting an indication of the CSI-RS resources that are activated.

Therefore, D1 fails to teach or suggest “dynamically transmitting to a wireless device (16) an indication of channel state information reference signals, CSI-RS, resources, the indication indicating one or more than one CSI-RS resources within a configured plurality of CSI-RS resources configured to be used by the wireless device for CSI signaling (S100),” as recited in independent Claim 1. D1 also fails to teach or suggest the similar features of the remaining independent Claims 11, 21, 37, 40, 43-45, 48 and 49.

Regarding inventive step, Applicant further notes that attempts to manage CSI-RS overhead and supporting beam management in an efficient manner have led to numerous discussions among persons skilled-in-the art, as illustrated at least by various 3GPP documents on this topic, including prior art document R1-168046 “WF on Aperiodic CSI-RS for Rel.14,”

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Attorney Docket No: 1557-410PWO (P51346_WO1)

RAN1#86, August 2016." As noted above, the subject matter of the amended independent claims 1 describes an advancement in efficiency over the prior art method of R1-168046. D1-D3, whether considered individually or in combination, fail to bring additional contributions. Applicant submits that independent Claims 1, 11, 21, 37, 40, 43-45, 48 and 49 are inventive over D1-D3 and common knowledge of persons skilled in the art.

Hence, independent Claims 1, 11, 21, 37, 40, 43-45, 48 and 49 are allowable, i.e., they are novel, have industrial applicability and possess an inventive step.

The Written Opinion asserts that dependent Claims 2-10, 12-20, 38, 39, 41 and 42 allegedly fail to recite subject matter that exhibits inventive step over the cited references D1, D2 and D3. Applicant respectfully traverses these rejections. These claims depend from one or another of independent Claims 1, 11, 21, 37, 40, 43-45, 48 and 49, and are therefore allowable, at least by virtue of their dependency from an allowable independent claim.

Re Item VII-VIII

The Written Opinion further objects to the claims and specification for various reasons. These issues are deferred to the national stages.

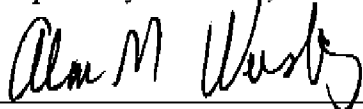
While the Applicant does not concede that the claims as originally presented are unclear, the claim amendments submitted herewith render the claimed subject matter clearer than the originally filed claims. Therefore, these amendments should not be construed as an admission by the Applicant of lack of novelty and/or inventiveness of the previous presented claims.

For the above reasons, Applicant respectfully asserts that all claims are in proper form, are novel and possess inventive step.

Respectfully submitted,

Date: August 30, 2018

By:


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What is claimed is:

1. A method at a network node (14), the method comprising:
dynamically transmitting to a wireless device (16) an indication of channel state
5 information reference signals, CSI-RS, resources, the indication indicating one or more than
one CSI-RS resources within a configured plurality of CSI-RS resources configured to be
used by the wireless device for CSI signaling (S100).
2. The method of Claim 1, wherein the plurality of CSI-RS resources configured to be
10 used by the wireless device (16) for CSI signaling are configured through higher layers.
3. Cancelled.
4. The method of any of Claims 1-3, wherein the indication is transmitted with one of
15 downlink control information, DCI, and Medium Access Control Control Element, MAC CE
signaling.
5. The method of any of Claims 1-3, wherein the indication indicates two temporally-
successive orthogonal frequency division multiplex, OFDM, symbols, each of the two
20 temporally-successive OFDM symbols being associated with at least one of two ports to form
a resource element.
6. The method of any of Claims 1-3, wherein the indication indicates two successive
frequency units forming one orthogonal frequency division multiplex, OFDM, symbol, each
25 of the two frequency units being associated with at least one of two ports to form a resource
element.
7. The method of any of Claims 5 and 6, wherein multiple different indications of
different aggregations of resource elements are configured for the wireless device (16).

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8. The method of any of Claims 5 and 6, wherein at least two different aggregations of resource elements share at least a pair of CSI-RS resources in common.

9. The method of any of Claims 1-8, wherein a number of resources sets are configured from a pool of N CSI-RS resources.

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10. The method of any of Claims 1-8, wherein a report setting is based on resource settings applicable to a set of CSI-RS resources.

11. A network node (14), comprising:

5 a transceiver (28) configured to dynamically transmit to a wireless device (16) an indication of channel state information reference signals, CSI-RS, resources, the indication indicating one or more than one CSI-RS resource within a configured plurality of CSI-RS resources configured to be used by the wireless device (16) for CSI signaling.

10 12. The network node (14) of Claim 11, wherein the plurality of CSI-RS resources configured to be used by the wireless device (16) for CSI signaling are configured through higher layers.

13. Cancelled.

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14. The network node (14) of any of Claims 11-13, wherein the indication is transmitted with one of downlink control information, DCI, and Medium Access Control Control Element, MAC CE signaling.

20 15. The network node (14) of any of Claims 11-13, wherein the indication indicates two temporally-successive orthogonal frequency division multiplex, OFDM, symbols, each of the two temporally-successive OFDM symbols being associated with at least one of two ports to form a resource element.

25 16. The network node (14) of any of Claims 11-13, wherein the indication indicates two successive frequency units forming one orthogonal frequency division multiplex, OFDM, symbol, each of the two frequency units being associated with at least one of two ports to form a resource element.

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17. The network node (14) of any of Claims 15 and 16, wherein multiple different indications of different aggregations of resource elements are configured for the wireless device (16).

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18. The network node (14) of any of Claims 15 and 16, wherein at least two different aggregations of resource elements share at least a pair of CSI-RS resources in common.

5 19. The network node (14) of any of Claims 11-18, wherein a number of resources set is configured from a pool of N CSI-RS resources.

20. The network node (14) of any of Claims 11-19, wherein a report setting is based on resource settings applicable to a set of CSI-RS resources.

10

21. A network node (14), comprising:

a transceiver module (29) configured to dynamically transmit to a wireless device (16) an indication of channel state information reference signals, CSI-RS, resources, the indication indicating one or more than one CSI-RS resource within a configured plurality of CSI-RS

15 resources configured to be used by the wireless device (16) for CSI signaling.

22. A method at a network node (14) of configuring channel state information reference signals, CSI-RS, the method comprising:

determining a set of CSI-RS resource elements, the set comprising at least two CSI-

20 RS resources (S102); and

aggregating a plurality of CSI-RS resource elements into resources within a resource pool (S104).

23. The method of Claim 22, wherein the plurality of CSI-RS resource elements

25 configured to be used by the wireless device (16) for CSI signaling has been configured through higher layers.

24. The method of Claim 22, further comprising indicating an aggregation of CSI-RS resource elements to a wireless device (16).

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25. The method of Claim 24, wherein the indicating is by dynamic signaling.
26. The method of Claim 24, wherein the indicating is by downlink control information, DCI.

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27. The method of any of Claims 22-26, wherein the set of CSI-RS resource elements support a plurality of wireless devices (16) for cell-specific beam sweep whereby the wireless devices (16) measure a same beam.

28. The method of any of Claims 22-26, wherein different sets of CSI-RS resource elements are indicated to different wireless devices (16) to enable each of the different wireless devices (16) to measure a channel on a different beam.

29. A network node (14) for configuring channel state information reference signals, CSI-RS, the network node (14) comprising:

processing circuitry (22) configured to:

determine a set of CSI-RS resource elements, the set comprising at least two CSI-RS resources; and

aggregate a plurality of CSI-RS resource elements into resources within a resource pool.

30. The network node (14) of Claim 29, wherein the plurality of CSI-RS resource elements configured to be used by the wireless device (16) for CSI signaling have been configured through higher layers.

31. The network node (14) of Claim 30, further comprising indicating an aggregation of CSI-RS resource elements to a wireless device (16).

32. The network node (14) of Claim 31, wherein the indicating is by dynamic signaling.

33. The network node (14) of any of Claims 31 and 32, wherein the indicating is by downlink control information, DCI.

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34. The network node (14) of any of Claims 29-33, wherein the set of CSI-RS elements support a plurality of wireless devices (16) for cell-specific beam sweep whereby the wireless devices (16) measure a same beam.

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35. The network node (14) of any of Claims 29-33, wherein different sets of CSI-RS resource elements are indicated to different wireless (16) devices to enable each of the
5 different wireless devices (16) to measure a channel on a different beam.

36. A network node (14) for configuring channel state information reference signals, CSI-RS, the network node (14) comprising:

10 a CSI-RS resource pool determination module (19) configured to determine a set of CSI-RS resource elements, the set comprising at least two CSI-RS resources; and
an aggregation module (21) configured to aggregate a plurality of CSI-RS resource elements into resources within a resource pool.

37. A method at a wireless device (16), the method comprising:

15 receiving a dynamic indication of channel state information reference signals, CSI-RS, resources, the indication indicating one or more than one CSI-RS resources within a configured plurality of CSI-RS resources configured to be used by the wireless device 16 for CSI signaling (S106); and
performing CSI signaling on the at least one CSI resources (S108).

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38. The method of Claim 37, wherein the indication indicates two temporally-successive orthogonal frequency division multiplex, OFDM, symbols, each of the two temporally-successive OFDM symbols being associated with at least one of two ports to form a resource element.

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39. The method of Claim 37, wherein the indication indicates two successive frequency units forming one orthogonal frequency division multiplex, OFDM, symbol, each of the two frequency units being associated with at least one of two ports to form a resource element.

30 40. A wireless device (16), comprising:
a transceiver (48) configured to:

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- receive a dynamic indication of channel state information reference signals,
CSI-RS, resources, the indication indicating one or more than one CSI-RS resources within a
5 configured plurality of CSI-RS resources configured to be used by the wireless device (16)
for CSI signaling; and
perform CSI signaling on the at least one CSI resources.

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41. The wireless device (16) of Claim 40, wherein the indication indicates two temporally-successive orthogonal frequency division multiplex, OFDM, symbols, each of the two temporally-successive OFDM symbols being associated with at least one of two ports to form a resource element.

42. The wireless device (16) of Claim 40, wherein the indication indicates two successive frequency units forming one orthogonal frequency division multiplex, OFDM, symbol, each of the two frequency units being associated with at least one of two ports to form a resource element.

43. A wireless device (16), comprising:
a transceiver module (49) configured to:
receive a dynamic indication of channel state information reference signals, CSI-RS, resources, the indication indicating one or more than one CSI-RS resources within a configured plurality of CSI-RS resources configured to be used by the wireless device (16) for CSI signaling; and
perform CSI signaling on the at least one CSI resources.

44. A method at base station (14), the method comprising:
dynamically transmitting to a user equipment (16) an indication of channel state information reference signals, CSI-RS, resources, the indication indicating one or more than one CSI-RS resources within a configured plurality of CSI-RS resources configured to be used by the user equipment (16) for CSI signaling.

45. A base station (14), comprising:
a transceiver (28) configured to dynamically transmit to a user equipment (16) an indication of channel state information reference signals, CSI-RS, resources, the indication indicating one or more than one CSI-RS resource within a configured plurality of CSI-RS resources configured to be used by the user equipment (16) for CSI signaling.

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46. A method at a base station (14) of configuring channel state information reference signals, CSI-RS, the method comprising:

determining a set of CSI-RS resource elements, the set comprising at least two CSI-RS resources; and

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aggregating a plurality of CSI-RS resource elements into resources within a resource pool.

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47. A base station (14) for configuring channel state information reference signals, CSI-RS, the base station comprising:

processing circuitry (22) configured to:

determine a set of CSI-RS resource elements, the set comprising at least two

10 CSI-RS resources; and

aggregate a plurality of CSI-RS resource elements into resources within a resource pool.

48. A method at a user equipment (16), the method comprising:

15

receiving a dynamic indication of channel state information reference signals, CSI-RS, resources, the indication indicating one or more than one CSI-RS resources within a configured plurality of CSI-RS resources configured to be used by the user equipment for CSI signaling (S106); and

performing CSI signaling on the at least one CSI resources (S108).

20

49. A user equipment (16), comprising:

a transceiver (48) configured to:

receive a dynamic indication of channel state information reference signals,

CSI-RS, resources, the indication indicating one or more than one CSI-RS resources within a

25 configured plurality of CSI-RS resources configured to be used by the user equipment for CSI signaling; and

perform CSI signaling on the at least one CSI resources.

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