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(81) Designated States (unless otherwise indicated, for every kind of national protection available):

AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,

(54) Title: POSITIONING ENHANCEMENTS FOR LOCATING A MOBILE DEVICE IN A WIRELESS NETWORK

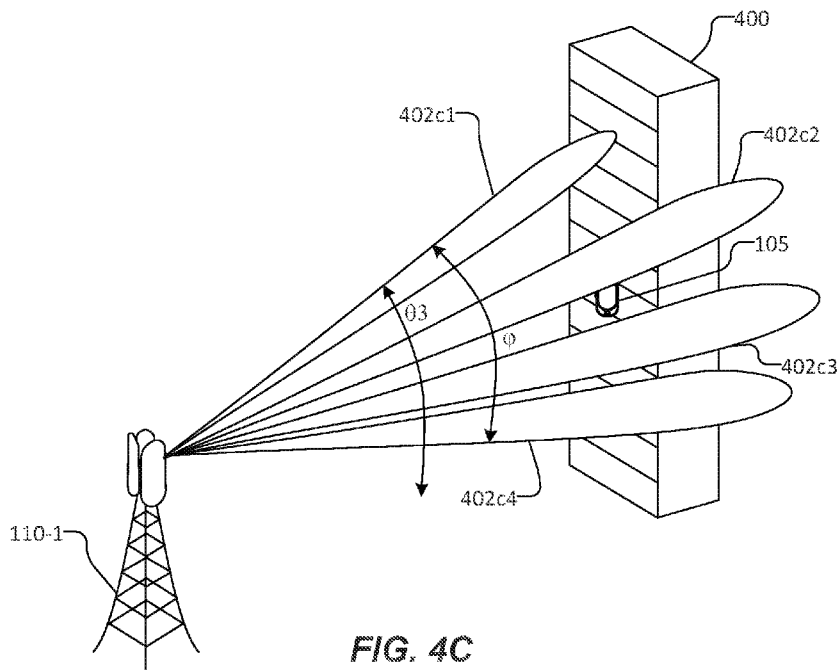


FIG. 4C

(57) Abstract: Techniques for determining a location of a mobile device are provided. An example of a method according to the disclosure includes determining, on the mobile device, beam identification information for one or more radio beams, transmitting, with the mobile device, the beam identification information to a network node, receiving, at the mobile device, positioning reference signal beam information for one or more positioning reference signals, generating, with the mobile device, one or more receive beams based on the positioning reference signal beam information, obtaining, with the mobile device, at least one measurement from at least one of the one or more positioning reference signals, and facilitating location determination of the mobile device at a location-capable device based at least in part on the at least one measurement.



SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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- *with international search report (Art. 21(3))*
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/059083

A. CLASSIFICATION OF SUBJECT MATTER

INV. G01S5/12
ADD. G01S5/00 G01S5/02 G01S5/10

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)
G01S

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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>"3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NG Radio Access Network (NG-RAN); Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN (Release 15)", 3GPP DRAFT; 38305-F10, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE</p> <p>1 October 2018 (2018-10-01), XP051519481, Retrieved from the Internet: URL: http://www.3gpp.org/ftp/tsg%5Fran/WG2%5FRL2/Specifications/201809%5Ffinal%5Fspec%5Fafter%5FRAN%5F81/38305%2Df10%2Ezip [retrieved on 2018-10-01] p. 37: 8.2.3.2.1.2 UE initiated Assistance -/--</p>	1-63

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&" document member of the same patent family</p>
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Date of the actual completion of the international search 6 May 2020	Date of mailing of the international search report 17/07/2020
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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 González Moreno, J
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/059083

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Data Transfer ----- WO 2017/164925 A1 (INTEL CORP [US]; DAVYDOV ALEXEI [RU]) 28 September 2017 (2017-09-28) par. 64-67	1-63
A	----- US 2017/339516 A1 (EDGE STEPHEN WILLIAM [US] ET AL) 23 November 2017 (2017-11-23) fig. 5, par. 74-81	1-63
A	----- NOKIA NETWORKS: "Potential enhancements for OTDOA", 3GPP DRAFT; R1-154738, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , vol. RAN WG1, no. Beijing, China; 20150824 - 20150828 23 August 2015 (2015-08-23), XP051001952, Retrieved from the Internet: URL: http://www.3gpp.org/ftp/Meetings_3GPP_ SYNC/RAN1/Docs/ [retrieved on 2015-08-23] the whole document -----	1-63

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/059083

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-63

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-63

Mobile device positioning with dynamic tailored assistance data;

2. claims: 64-80

Mobile device positioning pre-processing measurements;

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2019/059083

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2017164925 A1	28-09-2017	CN 108702726 A WO 2017164925 A1	23-10-2018 28-09-2017
US 2017339516 A1	23-11-2017	TW 201742493 A US 2017339516 A1 WO 2017204899 A1	01-12-2017 23-11-2017 30-11-2017