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H04W 64/00 (2009.01)

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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,  
SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,  
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kind of regional protection available): ARIPO (BW, GH,  
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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).

(54) Title: ANTENNA LOCALIZATION ACROSS AIR INTERFACE TYPES

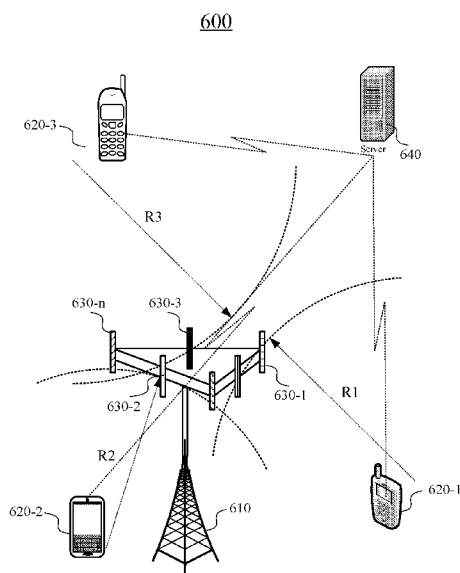


FIG. 6

(57) Abstract: Disclosed herein are techniques for determining a location of an antenna supporting structure. Crowdsourced data associated with antennas that are installed on a same antenna supporting structure but are used for different air interface types and/or data from aerial images can be used, alone or in combination, to more accurately and more efficiently determine the location of the antenna supporting structure and therefore the locations of the antennas on the antenna supporting structure.



**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

**Published:**

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

**(88) Date of publication of the international search report:**

19 April 2018 (19.04.2018)

INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2017/047228

A. CLASSIFICATION OF SUBJECT MATTER  
 INV. G01S5/02 H04W24/08 H04W64/00 H04W4/02  
 ADD. G06T7/73

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 H04W G06T

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.
X	US 2005/037775 A1 (MOEGLEIN MARK [US] ET AL) 17 February 2005 (2005-02-17)	1-8, 10-18, 20-25, 27-30
Y	paragraphs [0002], [0003], [0007], [0032], [0033], [0041], [0042], [0043], [0052], [0058], [0064] -----	9,19,26
X	US 2015/341894 A1 (ROWITCH DOUGLAS NEAL [US]) 26 November 2015 (2015-11-26)	1-8, 10-18, 20-25, 27-30
A	paragraphs [0022], [0023], [0024], [0032] -----	9,19,26
Y	US 2011/007941 A1 (CHEN CHING-CHIEN [US] ET AL) 13 January 2011 (2011-01-13) paragraphs [0009], [0010], [0011] -----	9,19,26
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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 application or patent 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  12 March 2018	Date of mailing of the international search report  19/03/2018
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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  Rüschmann, Frank
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# INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2017/047228

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2016/063732 A1 (CHEN XIN [US] ET AL) 3 March 2016 (2016-03-03) paragraph [0053] -----	9,19,26

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2017/047228

## 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.:

### 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: 1-8, 10-18, 20-25, 27-30

A method for determining a location of an antenna supporting structure, the method comprising: obtaining a first set of data associated with a first antenna for a first air interface type, the first antenna installed on the antenna supporting structure; obtaining a second set of data associated with a second antenna for a second air interface type different from the first air interface type, the second antenna installed on the antenna supporting structure; and determining the location of the antenna supporting structure using combined data comprising the first set of data and the second set of data. Hereby the location determination is based on different information provided by the two air interface types.

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2. claims: 9, 19, 26

A method for determining a location of an antenna supporting structure, the method comprising: obtaining a first set of data associated with a first antenna for a first air interface type, the first antenna installed on the antenna supporting structure; obtaining a second set of data associated with a second antenna for a second air interface type different from the first air interface type, the second antenna installed on the antenna supporting structure; and determining the location of the antenna supporting structure using combined data comprising the first set of data and the second set of data. Hereby the determination is based on areal image processing.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2017/047228

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005037775	A1	17-02-2005	BR PI0411915 A 08-08-2006
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			EP 1639855 A1 29-03-2006
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