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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, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, 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, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

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(54) **Title:** SOUNDING REFERENCE SIGNAL TRANSMISSION AND RECEPTION IN NON-TERRESTRIAL NETWORKS

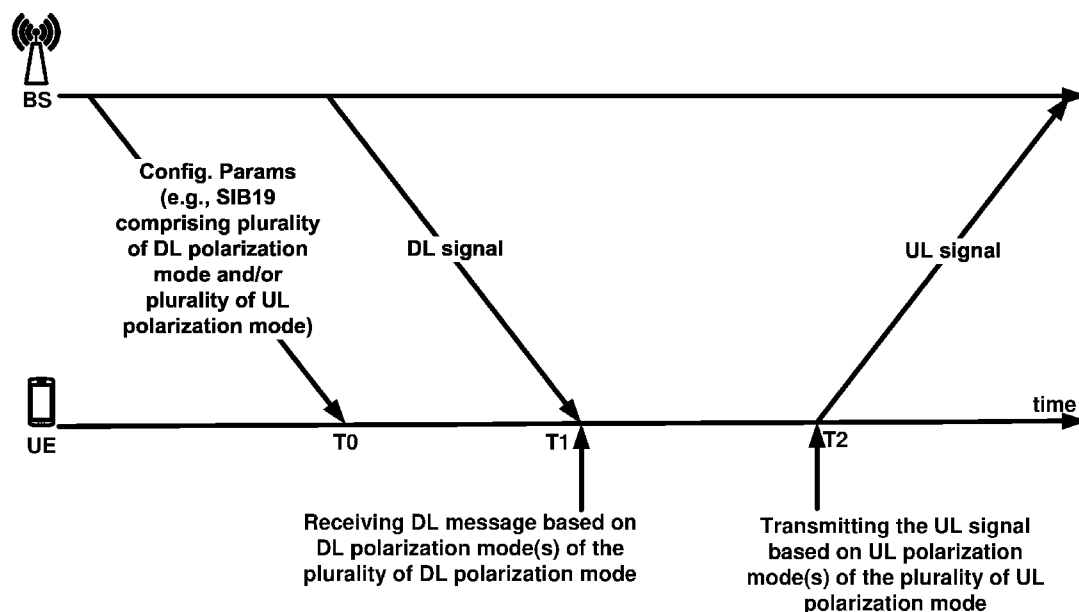


FIG. 23

(57) **Abstract:** A method may include receiving, by a wireless device, one or more configuration parameters indicating at least one sounding reference signal (SRS) resource for a first non-terrestrial network (NTN) node of a cell and a second NTN node of the cell. The method may also include transmitting, via the first NTN node of the cell and the at least one SRS resource, a first SRS transmission. The method may further include transmitting, via the second NTN node of the cell and the at least one SRS resource, a second SRS transmission.

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, ME, 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).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

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))*

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2023/033507

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04L5/00 H04W56/00

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)

H04L 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 practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MODERATOR (THALES): "FL Summary #4: Network verified UE location for NR NTN", 3GPP DRAFT; R1-2207631, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , vol. RAN WG1, no. Toulouse, France; 20220822 - 20220826 5 September 2022 (2022-09-05), XP052275564, Retrieved from the Internet: URL:https://ftp.3gpp.org/tsg_ran/WG1_RL1/T SGR1_110/Docs/R1-2207631.zip [retrieved on 2022-09-05] Section 3.1 Section 3.2 Section 6.1 --/--	1-6, 8, 10-17, 35-39



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)

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"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

1 February 2024

Date of mailing of the international search report

08/04/2024

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2023/033507

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.:

6 (completely); 1-5, 8, 10-17, 35-39 (partially)

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: 6(completely); 1-5, 8, 10-17, 35-39(partially)

Group I(a): Determining timing advance parameters for two NTN nodes and transmitting SRS via the NTN nodes [based on the received parameters]

2. claims: 7(completely); 1-5, 8, 10-17, 35-39(partially)

Group I(b): Receiving antenna polarisation parameters for two NTN nodes and transmitting SRS via the NTN nodes [based on the received parameters]

3. claims: 9(completely); 1-5, 8, 10-17, 35-39(partially)

Group I(c): Receiving spatial relation parameters for two NTN nodes and transmitting SRS via the NTN nodes [based on the received parameters]

4. claims: 18-34(completely); 35-39(partially)

Group II: Transmitting PUSCH in NTN based on transmission parameters used for the most recent SRS transmission

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2023/033507

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	----- "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Physical channels and modulation (Release 17)", 3GPP STANDARD; TECHNICAL SPECIFICATION; 3GPP TS 38.211, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , vol. RAN WG1, no. V17.3.0 21 September 2022 (2022-09-21), pages 1-136, XP052210877, Retrieved from the Internet: URL:https://ftp.3gpp.org/Specs/archive/38_ series/38.211/38211-h30.zip [retrieved on 2022-09-21] Section 4.3.1	1-6, 8, 10-17, 35-39
	----- LIU WENJIA ET AL: "Uplink Time Synchronization Method and Procedure in Release-17 NR NTN", 2022 IEEE 95TH VEHICULAR TECHNOLOGY CONFERENCE: (VTC2022-SPRING), IEEE, 19 June 2022 (2022-06-19), pages 1-5, XP034176695, DOI: 10.1109/VTC2022-SPRING54318.2022.9860357 Section III figure 4 -----	1-6, 8, 10-17, 35-39