IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Atty. Dkt.: SLA3814.1_6112-0174

Date: May 10, 2019

Attached for filing is the **UTILITY** patent application of:
First Named Inventor: ISHII, Atsushi
Entitled: APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
including the attachments as noted below:

Application and Signed Documents
56 pages of Specification, Claims and Abstract (including 8 numbered claims)
23 sheets of Drawing(s) (1-8, 9A-9C, 10-12, 13A-13D, 14-16, 17A-17B, 18A-18B and 19 - 23)
☐ Declaration ☐ Combined Declaration and Assignment (submitted via EPAS) ☐ Verified Translation of Declaration
☐ Newly executed; ☐ A copy from a prior application (37 CFR 1.63(d))
☐ Assignment and Recordation Form Cover Sheet (paper filing) ☐ Assignment (submitted via EPAS)
☒ Power of Attorney ☐ 37 CFR 3.73(b) or 37 CFR 3.73(c) Statement ☒ General Power of Attorney Transmittal Letter
☒ Application Data Sheet
☐ English Translation

Priority Claim (Domestic and/or Foreign) (**must** be included in Application Data Sheet)
☒ Provisional/Nonprovisional Application(s) are identified in attached Application Data Sheet
☒ Continuation/Division/Continuation-In-Part parent application(s) are identified in attached Application Data Sheet
☒ PCT/foreign application(s) is/are identified in attached Application Data Sheet
☒ Incorporation by Reference statement is in the specification or Preliminary Amendment
☒ Copy the incorporation by reference from the specification or Preliminary Amendment and insert text here:
This application is a continuation of PCT Application PCT/US2019/031674 filed May 10, 2019, which claims the priority and benefit of US provisional application 62/669,851, filed May 10, 2018, entitled "APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED INFORMATION IN WIRELESS COMMUNICATIONS", each of which is incorporated herein by reference in their entirety.

Certified Copy/Copies
☐ Certified copy(ies) of foreign application(s) attached
☐ Certified copy(ies) filed on in prior Application No. filed
☐ Interim copy(ies) of priority document(s) (effective March 16, 2013)
☐ Request to Retrieve Electronic Priority Application(s) (for a non-EPO priority doc that is of record in an EPO application or a non-JPO priority document that is of record in a JPO application)

Prior U.S. Application(s)
☐ Request under 37 CFR 1.48(a) to delete inventor(s) named in prior application
☐ Petition filed in prior application to extend its life to ensure co-pendency of parent application

Preliminary Amendment
☐ Preliminary Amendment (Please enter the attached Preliminary Amendment prior to calculation of claims fees.)

Information Disclosure Statement
☒ Information Disclosure Statement (IDS) and Form(s) PTO/SB/08 or equivalent
☒ Copies of newly cited publications, other than U.S. patents and U.S. patent application publications, are attached
☐ English language and/or "concise explanation" is/was provided for each foreign language document
☒ Form(s) PTO/SB/08 or equivalent listing the references cited in the parent application(s) (for continuing cases)

Other Documents
☐ Non-Publication Request
☐ Nucleotide and/or Amino Acid Sequence Submission ☐ Computer Readable Form (CRF)/☐ Specification Sequence Listing on ☐ CD-ROM or CD-R (2 copies) or ☐ Paper/☐ Statements verifying identity of above copies
☐ Authorization to Permit Access to Search Results by the European Patent Office (EPO) (Form PTO/SB/69 or equivalent)
☐ Other (itemize each attachment):

Small Entity

☐ Applicant claims "small entity" status. ☐ "Small entity" statement(s) attached

Micro Entity

☐ Applicant claims "micro entity" status. ☐ Micro entity certification statement filed herewith.

Fee Calculation

Utility Basic Filing Fee					$300.00 (1011)/$150.00 (2011)/$75.00 (3011) $75.00 (4011)	$	300.00
Utility Search Fee					$660.00 (1111)/$330.00 (2111)/$165.00 (3111)	$	660.00
Utility Examination Fee					$760.00 (1311)/$380.00 (2311)/$190.00 (3311)	$	760.00
Utility Application Size Fee ($400.00 (1081)/$200.00 (2081)/$100.00 (3081))for each additional 50 pages that exceeds 100 pages):							
Paper filing: Total pages:	-100 = 0	=	0	$0.00 (1081)	/$0.00 (2081)/$0.00 (3081)	$	
Surcharge for Paper Filing					$400.00 (1090)/$200.00 (2090)/$200.00 (3090)	$	
E-filing:				$0.00(1081)	/$0.00 (2081)/$0.00 (3081)	$	
Total pages: 79 *.75 = 59–100 = 0/50		=	0				
Total effective claims	8 - 20 (at least 20) =	0	x $100.00	= $0.00 (1202)/$0.00 (2202)/$0.00 (3202)		$	
Independent claims	4 - 3 (at least 3) =	1	x $460.00	= $0.00 (1201)/$0.00 (2201)/$0.00 (3201)		$	460.00
If any proper multiple dependent claims now added for first time, add $820.00 (1203)/$410.00 (2203)/$205.00 (3203) (ignore improper)						$	
Assignment Recording Fee					$50.00 (8021) **/$0 if filed electronically**	$	
Prepayment of Surcharge for Late Declaration					$160.00 (1051)/$80.00 (2051)/$40.00 (3051)	$	160.00
English translation of specification and claims					$140.00 (1053)/$70.00 (2053)/$35.00 (3053)	$	
					TOTAL FEE	**$**	**2,340.00**

☒ CREDIT CARD OR DEPOSIT ACCOUNT PAYMENT (CREDIT CARD FORM ATTACHED IF PAPER FILING).

Extension of Time

Any future submission requiring an extension of time is hereby stated to include a petition for such time extension.

Deposit Account Authorization

The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to Deposit Account No. 14-1140. However, **authorization is NOT given** hereby **to charge any extra claims fees or multiple dependent claims fees**.

Correspondence Address:
Customer Number: **126613**
Telephone: (703) 816-4000
Facsimile: (703) 816-4100
HWB:lsh

NIXON & VANDERHYE P.C.
By Attorney: H. Warren Burnam, Jr., Reg. No. 29,366

Signature: /H. Warren Burnam, Jr./

Doc Code: PA
Document Description: Power of Attorney

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	To Be Assigned
Filing Date	May 10, 2019
First Named Inventor	ISHII, Atsushi
Title	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
Art Unit	To Be Assigned
Examiner Name	To Be Assigned
Attorney Docket Number	SLA3814.1_6112-0174

SIGNATURE of Applicant or Patent Practitioner

Signature	/H. Warren Burnam, Jr./	Date (Optional)	May 10, 2019
Name	H. Warren Burnam, Jr.	Registration Number	29,366
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

*Total of 2 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

PTO/AIA/80 (07-12)
Approved for use through 11/30/2014. OMB 0651-0035
U.S. Patent and Trademark Office; U.S DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

☒ Practitioners associated with Customer Number: 126613

OR

☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignments documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

☒ The address associated with Customer Number: 126613

OR

☐

Firm or Individual Name			
Address			
City		State	Zip
Country			
Telephone		Email	

Assignee Name and Address: Sharp Laboratories of America, Inc.
5750 NW Pacific Rim Blvd.
Camas, WA 98607

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be Filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of The practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature	/David C. Ripma/	Date	September 1, 2017
Name	David C. Ripma	Telephone	360-834-8754
Title	Patent Counsel of MiiCs IP, Inc. a subsidiary of SBPJ Co., Ltd. and Sharp Corporation		

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 126613

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☒ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

FG Innovation Company Limited

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	Chie Ming Chou	Date (Optional)	
Name	CHIE-MING CHOU		
Title	CEO		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of 3 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

INFORMATION DISCLOSURE CITATION	ATTY. DOCKET NO.	APPLICATION NO.
	SLA3814.1_6112-0174	To Be Assigned
	INVENTOR(S)	
	ISHII	
(Use several sheets if necessary)	FILING DATE	ART UNIT
	May 10, 2019	To Be Assigned

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

FOREIGN PATENT DOCUMENTS

		DOCUMENT	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)

	1	R2-1804881, 3GPP TSG-RAN2 101bis, Samsung, "SIB1 Content for SI Request", Sanya, China, April 16-20, 2018
	2	R2-1805225, 3GPP TSG-RAN2 101bis, Huawei, HiSilicon, "MSG3 based other SI acquisition", Sanya, China, April 16-20, 2018
	3	R2-1804528, 3GPP TSG-RAN2 101bis, OPPO, "Discussion on Upper Layer Action upon RACH Problem and SI prohibit Timer", Sanya, China, April 16-20, 2018
	4	R2-1805057, 3GPP TSG-RAN2 101bis, LG Electronics Inc., "Clarification of broadcast indicator in SIB1", Sanya, China, April 16-20, 2018
	5	R2-1804987, 3GPP TSG-RAN2 101bis, Ericsson, "Duration of on-demand SI broadcast", Sanya, China, April 16-20, 2018
	6	R2-1805223, 3GPP TSG-RAN2 101bis, Huawei, HiSilicon, "Consideration on Indication for On-demand SI Broadcast", Sanya, China, April 16-20, 2018
	7	R2-1804266, 3GPP TSG-RAN2 101bis, CATT, "Open issues for Broadcasting Indicator", Sanya, China, April 16-20, 2018
	8	R2-1804267, 3GPP TSG-RAN2 101bis, CATT, "Indicator Granularity of on-demand SI Request", Sanya, China, April 16-20, 2018
	9	R2-1804268, 3GPP TSG-RAN2 101bis, CATT, "Awareness and RRC Action of on-demand SI Request Failure", Sanya, China, April 16-20, 2018
	10	R2- R2-1804284, 3GPP TSG-RAN2 101bis, ASUSTeK, "Msg1-based or Msg3-based SI request procedure", Sanya, China, April 16-20, 2018
	11	R2-1804309, 3GPP TSG-RAN2 101bis, Samsung, "SI Request Failure Handling & SI Period Monitoring for On Demand SI", Sanya, China, April 16-20, 2018
	12	R2-1804442, 3GPP TSG-RAN2 101bis, ZTE Corporation, Sanechips, "Consideration on the RACH resource and SI request mapping", Sanya, China, April 16-20, 2018
	13	R2-1804443, 3GPP TSG-RAN2 101bis, ZTE Corporation, Sanechips, "Consideration on Group based SI request Scheme", Sanya, China, April 16-20, 2018
	14	R2-1804444, 3GPP TSG-RAN2 101bis, ZTE Corporation, Sanechips, "Upper layer actions for the Random Access problem", Sanya, China, April 16-20, 2018
	15	R2-1804469, 3GPP TSG-RAN2 101bis, Spreadtrum Communications, "Msg1-based on-demand SI request", Sanya, China, April 16-20, 2018
	16	R2-1804592, 3GPP TSG-RAN2 101bis, vivo, "Beam Based on Demand SI Acquisition for Idle/Inactive UE", Sanya, China, April 16-20, 2018
	17	R2-1804593, 3GPP TSG-RAN2 101bis, vivo, "Failure Handling for On Demand SI Acquisition Procedure", Sanya, China, April 16-20, 2018

*Examiner		Date Considered	

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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INFORMATION DISCLOSURE CITATION	ATTY. DOCKET NO.	APPLICATION NO.
	SLA3814.1_6112-0174	To Be Assigned
	INVENTOR(S)	
	ISHII	
(Use several sheets if necessary)	FILING DATE	ART UNIT
	May 10, 2019	To Be Assigned

	18	R2-1804624, 3GPP TSG-RAN2 101bis, Xiaomi, "Further issues relates to on-demand SI", Sanya, China, April 16-20, 2018	
	19	R2-1804984, 3GPP TSG-RAN2 101bis, Ericsson, "On-demand SI reject procedure", Sanya, China, April 16-20, 2018	
	20	R2-1804998, 3GPP TSG-RAN2 101bis, LG Electronics Inc., "Details of MSG3 for SI request", Sanya, China, April 16-20, 2018	
	21	R2-1805017, 3GPP TSG-RAN2 101bis, Intel Corporation, "Remaining issues on on-demand System Information", Sanya, China, April 16-20, 2018	
	22	R2-1805224, 3GPP TSG-RAN2 101bis, Huawei, HiSilicon, "Consideration on MSG1 based OSI request", Sanya, China, April 16-20, 2018	
	23	R2-1805226, 3GPP TSG-RAN2 101bis, Huawei, HiSilicon, "Failure Handling for OSI Reception", Sanya, China, April 16-20, 2018	
	24	R2-1805933, 3GPP TSG-RAN2 101bis, LG Electronics Inc., "RACH failure for SI request", Sanya, China, April 16-20, 2018	
	25	U.S. Patent Application 16/408,853 filed May 10, 2019, entitled "APPARATUS AND METHOD FOR ACQUISITION OF ON-DEMAND SYSTEM INFORMATION IN WIRELESS COMMUNICATIONS"	

*Examiner		Date Considered	

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	Conf. No.:
ISHII	Atty. Dkt. No.: SLA3814.1_6112-0174
Appln. No. To Be Assigned	Art Unit: To Be Assigned
Filed: May 10, 2019	Examiner: To Be Assigned

For: APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION

* * * * * * * * * * * *

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Date: May 10, 2019

INFORMATION DISCLOSURE STATEMENT

Sir:

As suggested by 37 C.F.R. 1.97, the undersigned attorney brings to the attention of the Patent and Trademark Office the references listed on the attached form PTO-1449.

☒ All listed documents are attached.

☐ Copies of U.S. Patent Publications are not required and are not attached.

☐ Listed foreign patent publications and other documents are enclosed.

☐ The English translation is a machine translation provided by the Industrial Property Digital Library (IPDL) of the Japan Patent Office (JPO).

☐ The partial translations were provided to the undersigned by the applicants' foreign representative. The undersigned has no knowledge regarding the pertinency of the partially translated portions vis-á-vis the document as a whole. The partial translations are merely provided for whatever convenience they may be.

☐ The listed documents were cited in the ISR and copies should have been supplied by WIPO directly to the US PTO. If copies are not timely received from WIPO, please telephone the undersigned so that copies can be timely supplied for the Examiner's consideration in this US National Phase Application.

EX-1002
Ericsson Inc., Nokia v. Active Wireless Technologies
Page 009

This is not to be construed as a representation that a search has been made or that no better prior art exists, or that a reference is relevant merely because cited.

The Examiner is requested to initial the attached form PTO-1449 and to return a copy of the initialed document to the undersigned as an indication that the attached references have been considered and made of record.

The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

Respectfully submitted,
NIXON & VANDERHYE P.C.

By: /H. Warren Burnam, Jr./
H. Warren Burnam, Jr.
Reg. No. 29,366

HWB:lsh
901 North Glebe Road, 11th Floor
Arlington, VA 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATIONS
First Named Inventor/Applicant Name:	Atsushi Ishii
Filer:	H. Warren Burnam/Linda Hull
Attorney Docket Number:	SLA3814_1_6112-0174

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
Pages:				
Claims:				
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	1	460	460
Miscellaneous-Filing:				
LATE FILING FEE FOR OATH OR DECLARATION	1051	1	160	160

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**2340**

Electronic Acknowledgement Receipt

EFS ID:	35975478
Application Number:	16408922
International Application Number:	
Confirmation Number:	1156
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATIONS
First Named Inventor/Applicant Name:	Atsushi Ishii
Customer Number:	126613
Filer:	H. Warren Burnam
Filer Authorized By:	
Attorney Docket Number:	SLA3814_1_6112-0174
Receipt Date:	10-MAY-2019
Filing Date:	
Time Stamp:	14:12:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$2340
RAM confirmation Number	051319INTEFSW14130500
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Drawings-only black and white line drawings	SLA3814_1__6112-0174_drawings_2019_May_20.pdf	390650 c78af2f2a7e80b136727fcc1bc058034e2e752df	no	23
Warnings:					
Information:					
2		SLA3814_1__6112-0174_app_UScont_2019_May_10.pdf	340121 23f1553f3b2821964a1f285ed7ce86681daa368a	yes	56

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Abstract	56	56
	Claims	53	55
	Specification	1	52

Warnings:					
Information:					
3	Application Data Sheet	SLA3814_1_6112-0174_ADS.pdf	1256206 70bd3814b22ea54763caafc6b9fa91fe683a9291	no	8
Warnings:					
Information:					
4	Transmittal of New Application	SLA3814_1_6112-0174_nonprov_app_transmittal.pdf	70666 2910a67f8873b2f386fd6e9a540d54602ce9b473	no	2
Warnings:					
Information:					
5	Power of Attorney	SLA3814_1_6112-0174_power_of_atty_transmittal.pdf	79004 c0f1a732d561f3dbf276093fd1f59e7a6bc74145	no	1

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6	Power of Attorney	6112_MiiCs_Power_Of_Atty.pdf	69568 bd8828c1e149cdf67000abda4eb66fdcd94f3f15	no	2
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Information:					
7	Power of Attorney	FG_Innovative_POA.pdf	147176 762f966021d76dadd74fdb8ff00c0c9884ede9e6	no	1
Warnings:					
Information:					
8	Non Patent Literature	R2_1804881.pdf	279340 e48f097eddb8447be7113358873c117c9c9005f8	no	7
Warnings:					
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9	Non Patent Literature	R2_1805225.pdf	234201 e8ed9b461487c2f5202752bf1ba445cfb6d004c2	no	4
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10	Non Patent Literature	R2_1804528.pdf	123238 b32453f03385f5551e07a2eb07193951d031777d	no	4
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11	Non Patent Literature	R2_1805057.pdf	158982 cc4bb1bea35ebe5a57bf82e68c42f401f52eff4f	no	2
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Information:					
12	Non Patent Literature	R2_1804987st.pdf	195112 8b4d35f2076abe46f10e8b84b197add9d88ad9ca	no	4
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13	Non Patent Literature	R2_1805223.pdf	163838 f446cd784604b647ae7acc04cbf5e96317d15955	no	2
Warnings:					
Information:					
14	Non Patent Literature	R2_1804266.pdf	166736 fd2b904d1de7d1c1ee83cbbefd3728360d347417	no	3
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Information:					
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Information:					

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Information:					
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Information:					
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Information:					
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32		SLA3814_1_6112-0174_ids_1449.pdf	129985 a3754baf12e804401c22a2b058e57ceca1a0196b	yes	4

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Information Disclosure Statement (IDS) Form (SB08)	3	4
	Transmittal Letter	1	2

Warnings:
Information:

33	Fee Worksheet (SB06)	fee-info.pdf	38278 eacefa827d1f84b5b6941eb39d22202ae06fc4bb	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	7115867	

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

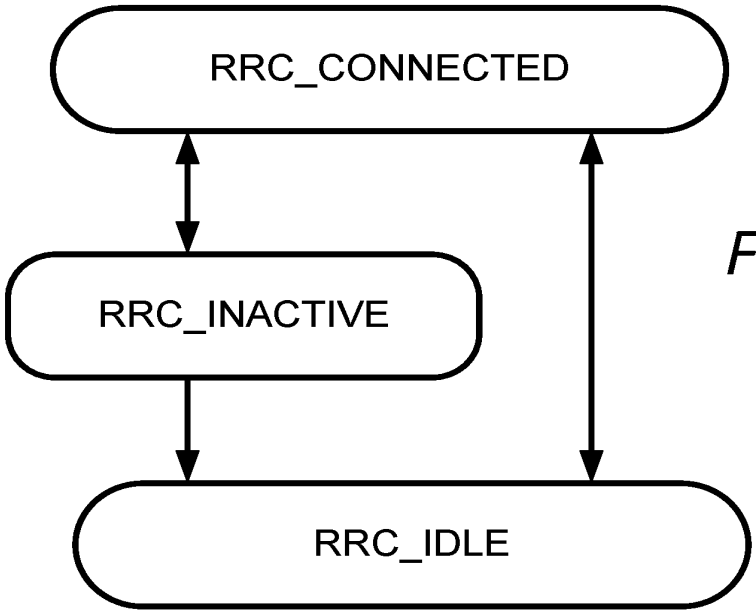

RRC_CONNECTED
RRC_INACTIVE
RRC_IDLE

Fig. 1

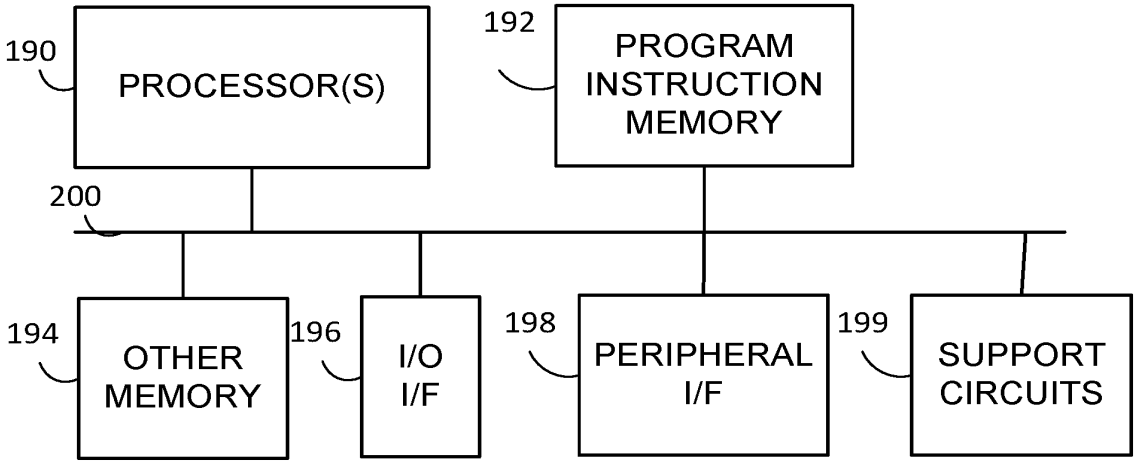

190
PROCESSOR(S)
192
PROGRAM INSTRUCTION MEMORY
200
194
OTHER MEMORY
196
I/O I/F
198
PERIPHERAL I/F
199
SUPPORT CIRCUITS

Fig. 23

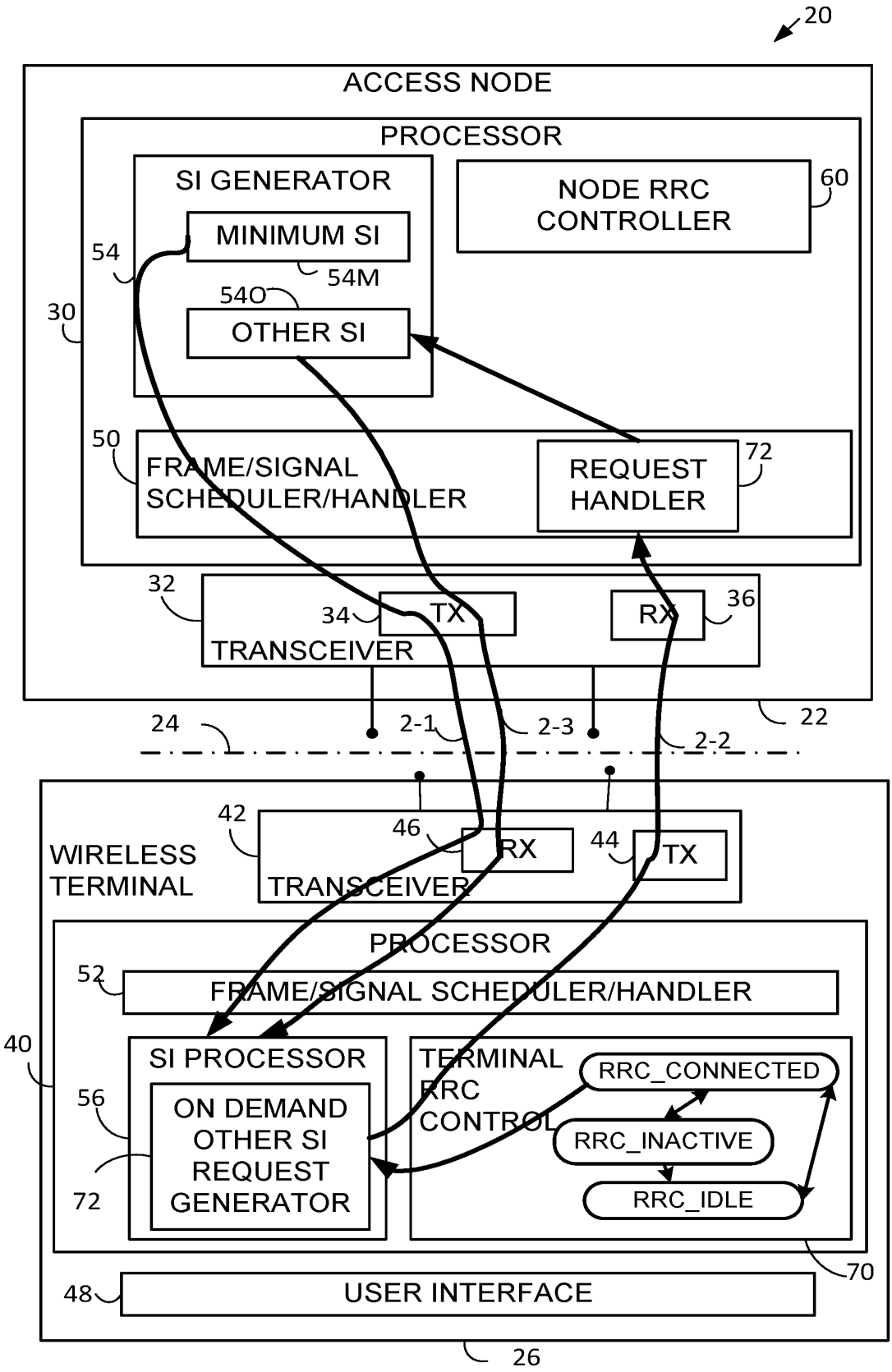

20
ACCESS NODE
PROCESSOR
SI GENERATOR
MINIMUM SI
54M
54
54O
OTHER SI
30
NODE RRC CONTROLLER
60
50
FRAME/SIGNAL SCHEDULER/HANDLER
REQUEST HANDLER
72
32
34
TX
RX
36
TRANSCEIVER
22
24
2-1
2-3
2-2
42
46
RX
44
TX
WIRELESS TERMINAL
TRANSCEIVER
PROCESSOR
52
FRAME/SIGNAL SCHEDULER/HANDLER
40
SI PROCESSOR
56
ON DEMAND OTHER SI REQUEST GENERATOR
72
TERMINAL RRC CONTROL
RRC_CONNECTED
RRC_INACTIVE
RRC_IDLE
70
48
USER INTERFACE
26

Fig. 2

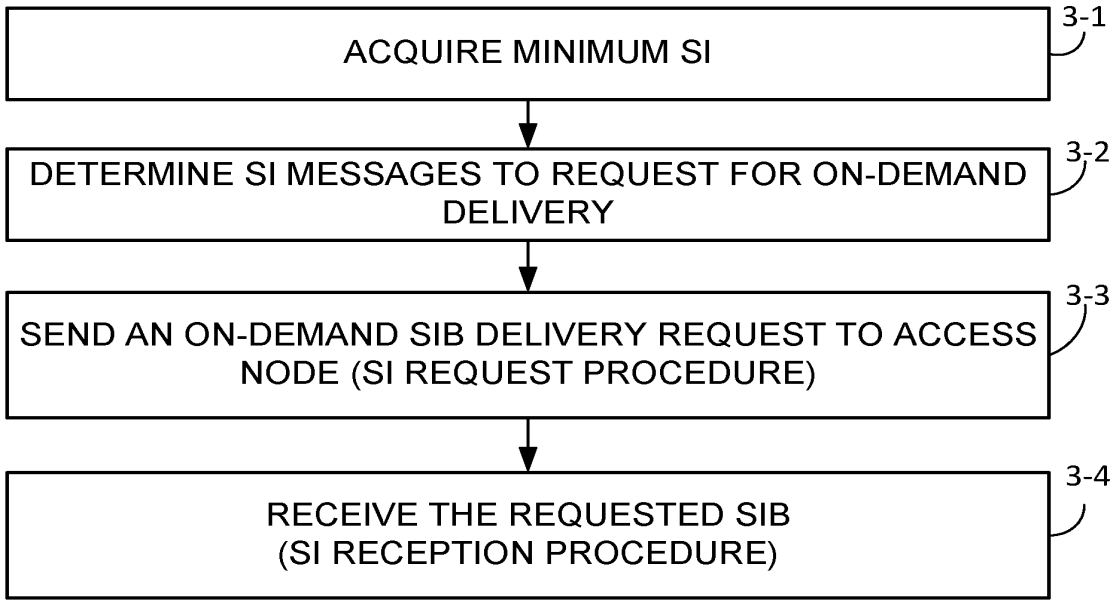

ACQUIRE MINIMUM SI
3-1
DETERMINE SI MESSAGES TO REQUEST FOR ON-DEMAND DELIVERY
3-2
SEND AN ON-DEMAND SIB DELIVERY REQUEST TO ACCESS NODE (SI REQUEST PROCEDURE)
3-3
RECEIVE THE REQUESTED SIB (SI RECEPTION PROCEDURE)
3-4

Fig. 3

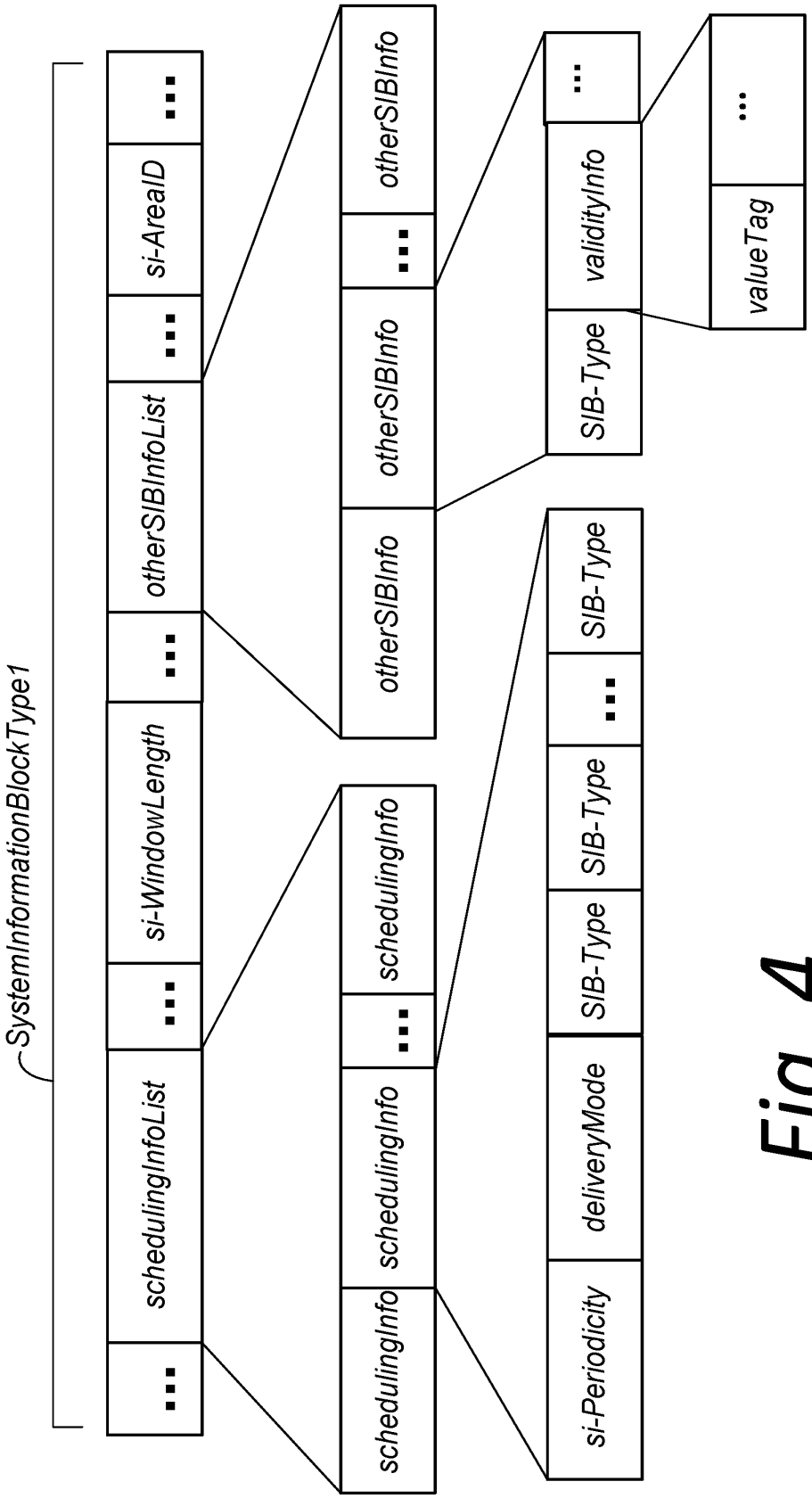

SystemInformationBlockType1
schedulingInfoList
si-WindowLength
otherSIBInfoList
si-AreaID
schedulingInfo
schedulingInfo
schedulingInfo
otherSIBInfo
otherSIBInfo
otherSIBInfo
si-Periodicity
deliveryMode
SIB-Type
SIB-Type
SIB-Type
SIB-Type
validityInfo
valueTag

Fig. 4

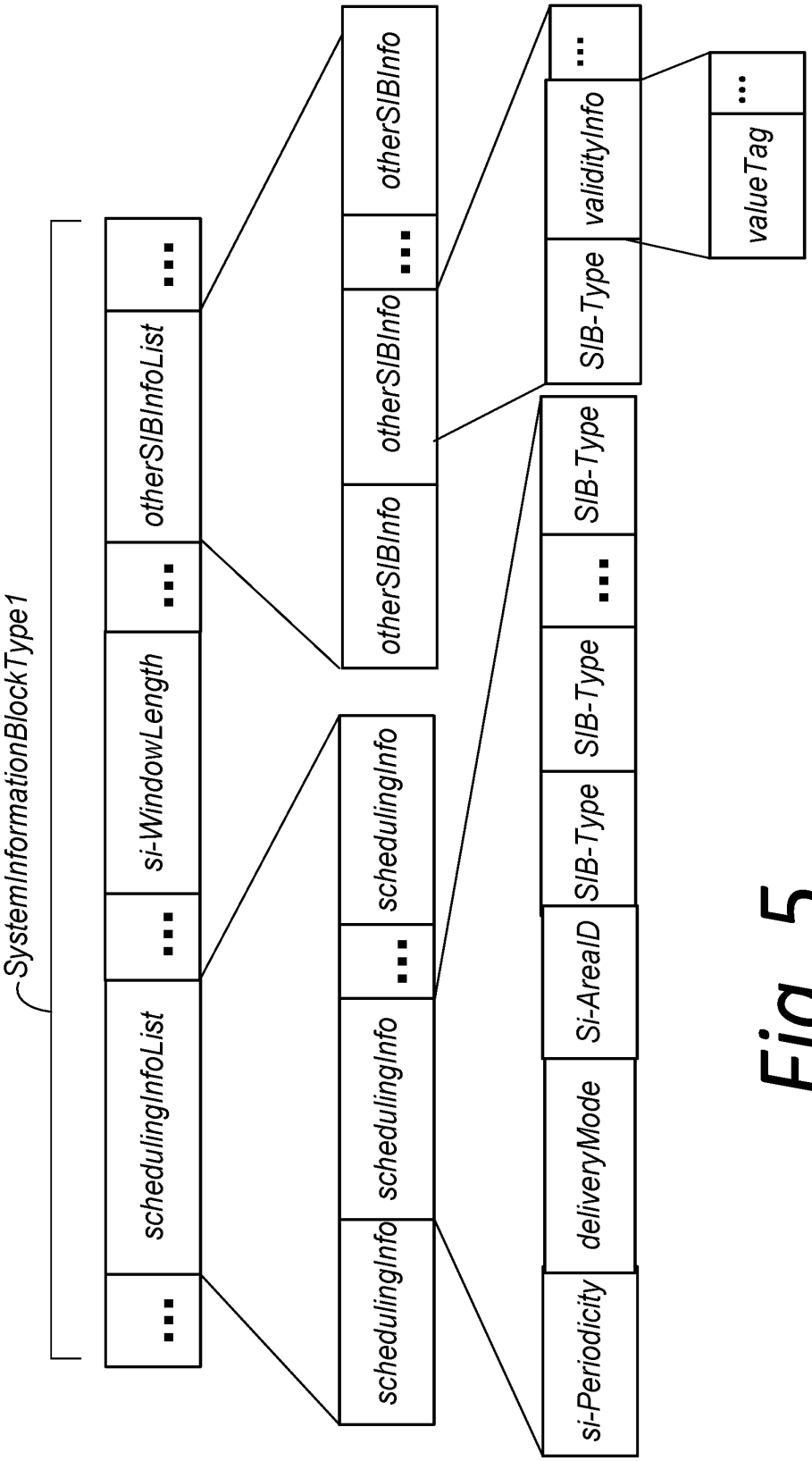

SystemInformationBlockType1
schedulingInfoList
si-WindowLength
otherSIBInfoList
schedulingInfo
otherSIBInfo
si-Periodicity
deliveryMode
Si-AreaID
SIB-Type
validityInfo
valueTag

Fig. 5

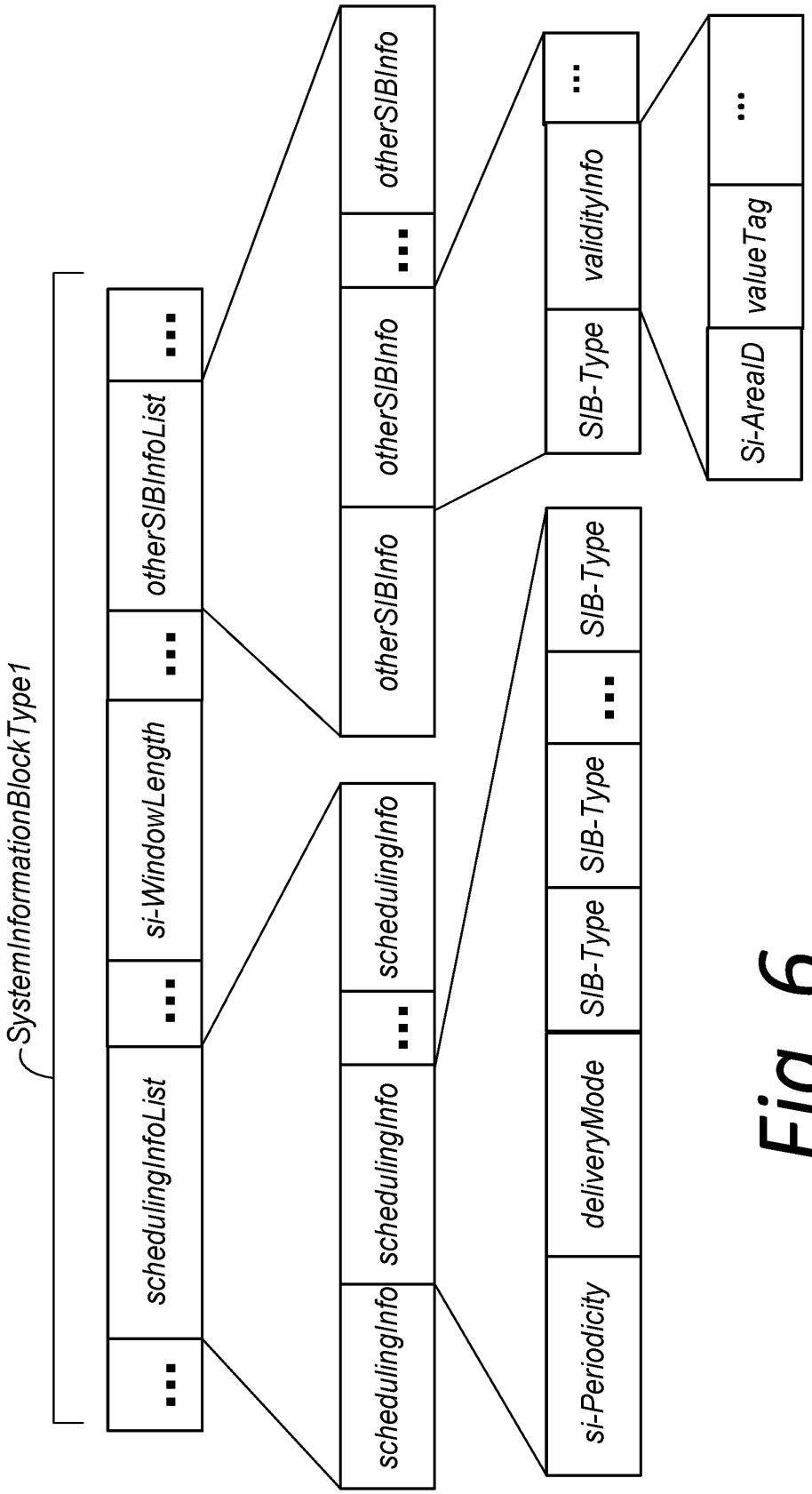

SystemInformationBlockType1
schedulingInfoList
si-WindowLength
otherSIBInfoList
schedulingInfo
schedulingInfo
schedulingInfo
otherSIBInfo
otherSIBInfo
otherSIBInfo
si-Periodicity
deliveryMode
SIB-Type
SIB-Type
SIB-Type
SIB-Type
validityInfo
Si-ArealD
valueTag

Fig. 6

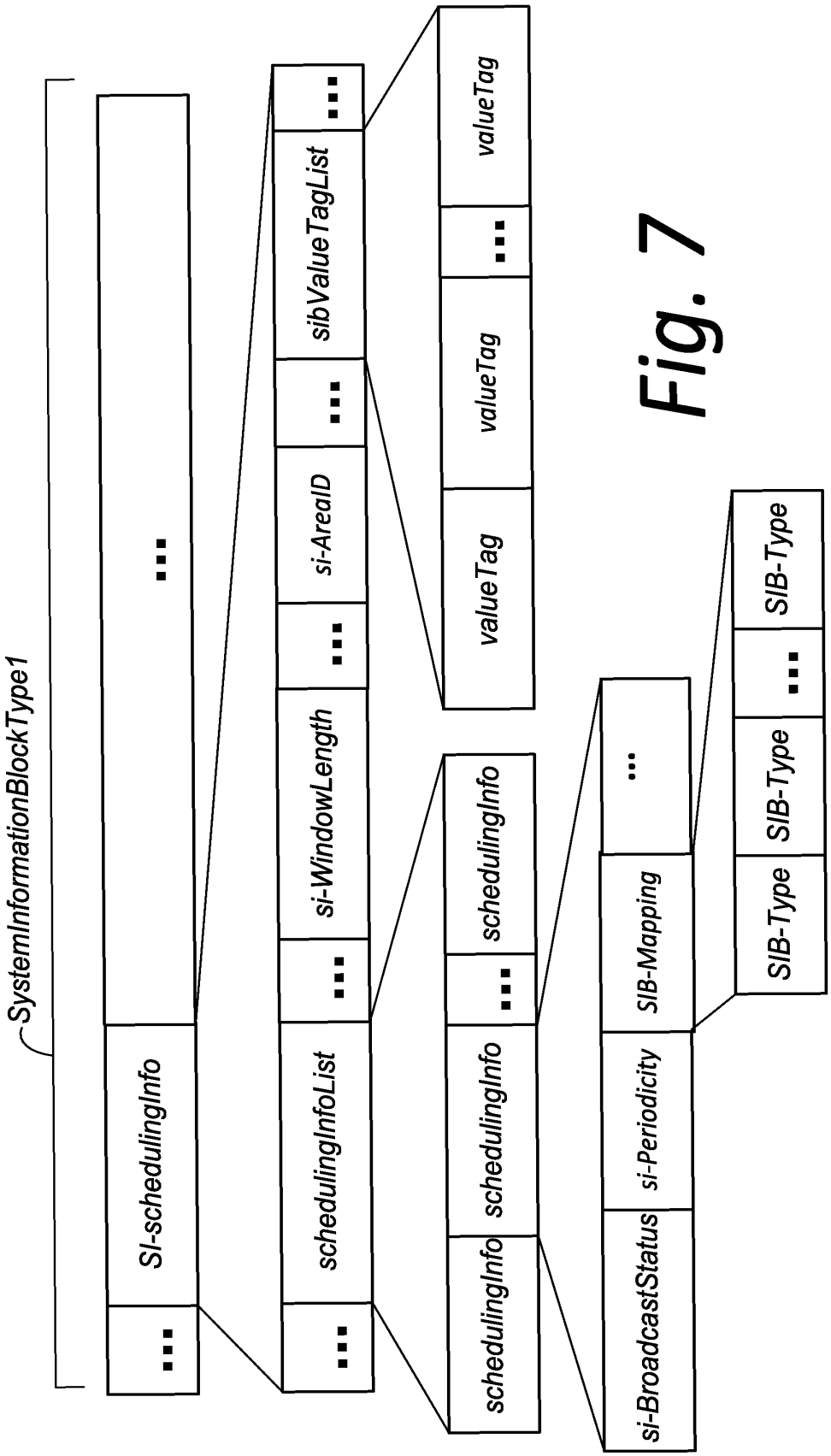

SystemInformationBlockType1
SI-schedulingInfo
schedulingInfoList
si-WindowLength
si-AreaID
sibValueTagList
valueTag
valueTag
valueTag
schedulingInfo
schedulingInfo
schedulingInfo
si-BroadcastStatus
si-Periodicity
SIB-Mapping
SIB-Type
SIB-Type
SIB-Type

Fig. 7

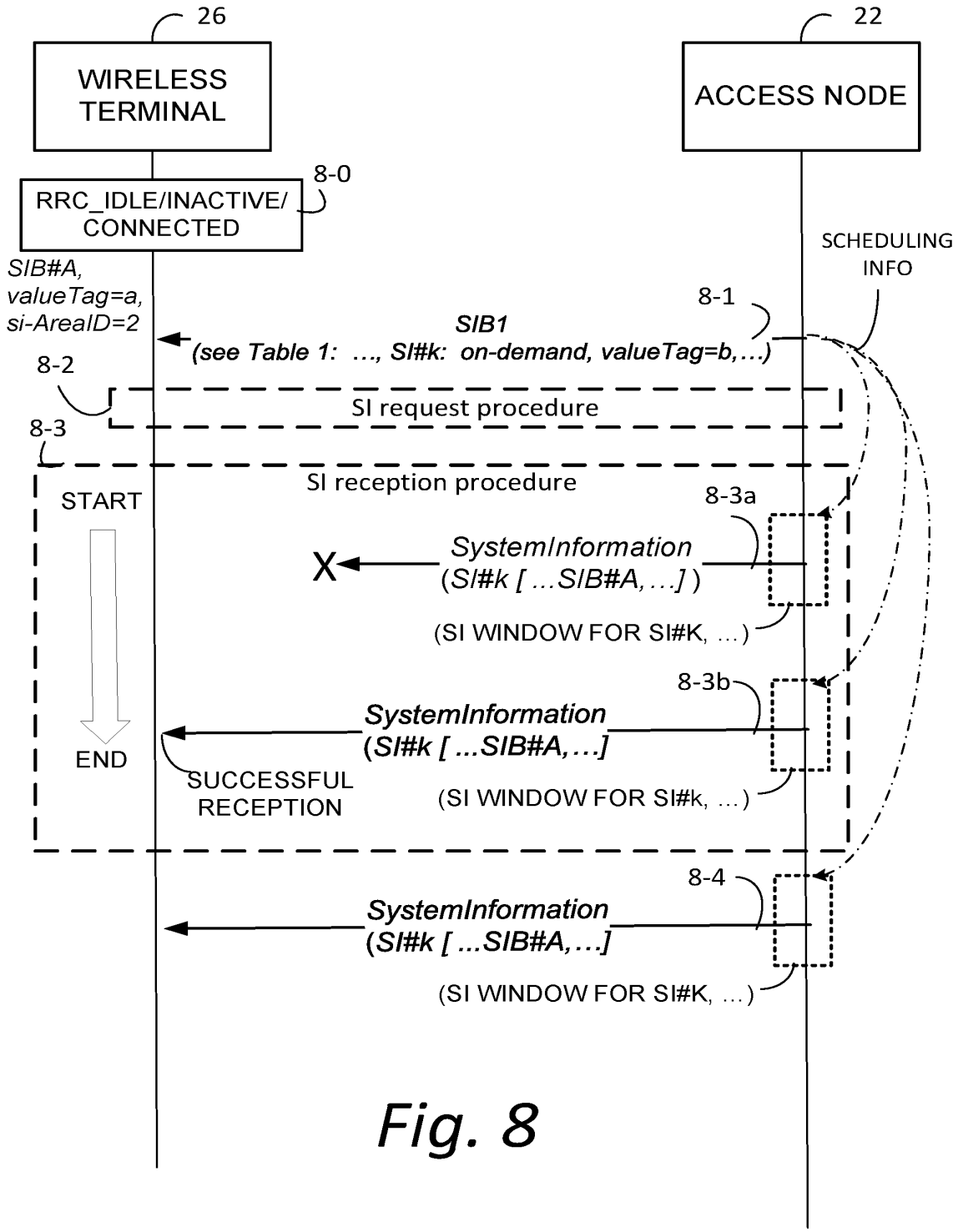

26
WIRELESS TERMINAL
22
ACCESS NODE
8-0
RRC_IDLE/INACTIVE/ CONNECTED
SCHEDULING INFO
SIB#A, valueTag=a, si-AreaID=2
8-1
SIB1
(see Table 1: …, SI#k: on-demand, valueTag=b,…)
8-2
SI request procedure
8-3
SI reception procedure
START
8-3a
SystemInformation (SI#k […SIB#A,…])
X
(SI WINDOW FOR SI#K, …)
8-3b
SystemInformation (SI#k […SIB#A,…]
END
SUCCESSFUL RECEPTION
(SI WINDOW FOR SI#k, …)
8-4
SystemInformation (SI#k […SIB#A,…]
(SI WINDOW FOR SI#K, …)

Fig. 8

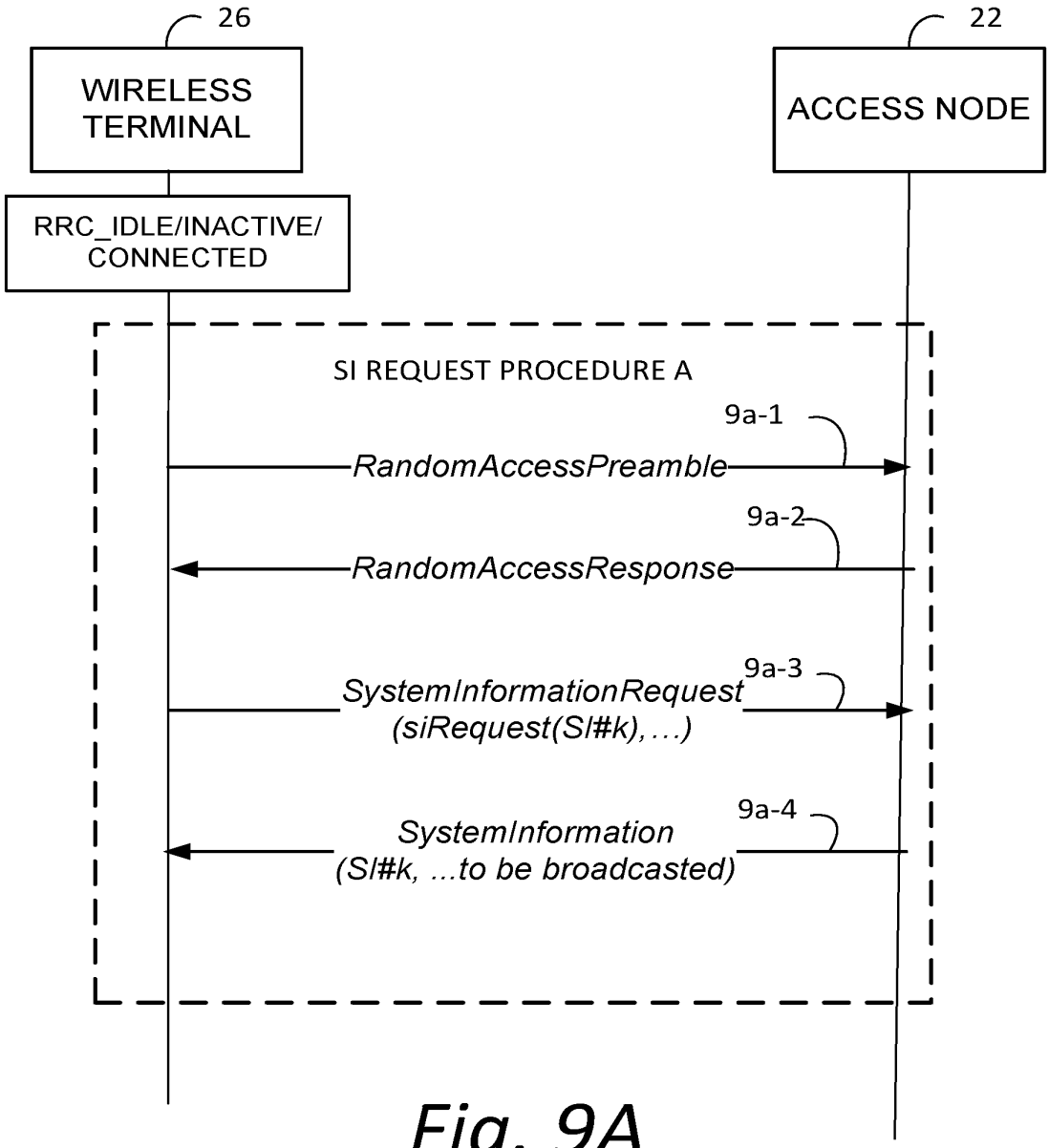

26
WIRELESS TERMINAL
22
ACCESS NODE
RRC_IDLE/INACTIVE/ CONNECTED
SI REQUEST PROCEDURE A
9a-1
RandomAccessPreamble
9a-2
RandomAccessResponse
9a-3
SystemInformationRequest
(siRequest(SI#k),…)
9a-4
SystemInformation
(SI#k, …to be broadcasted)

Fig. 9A

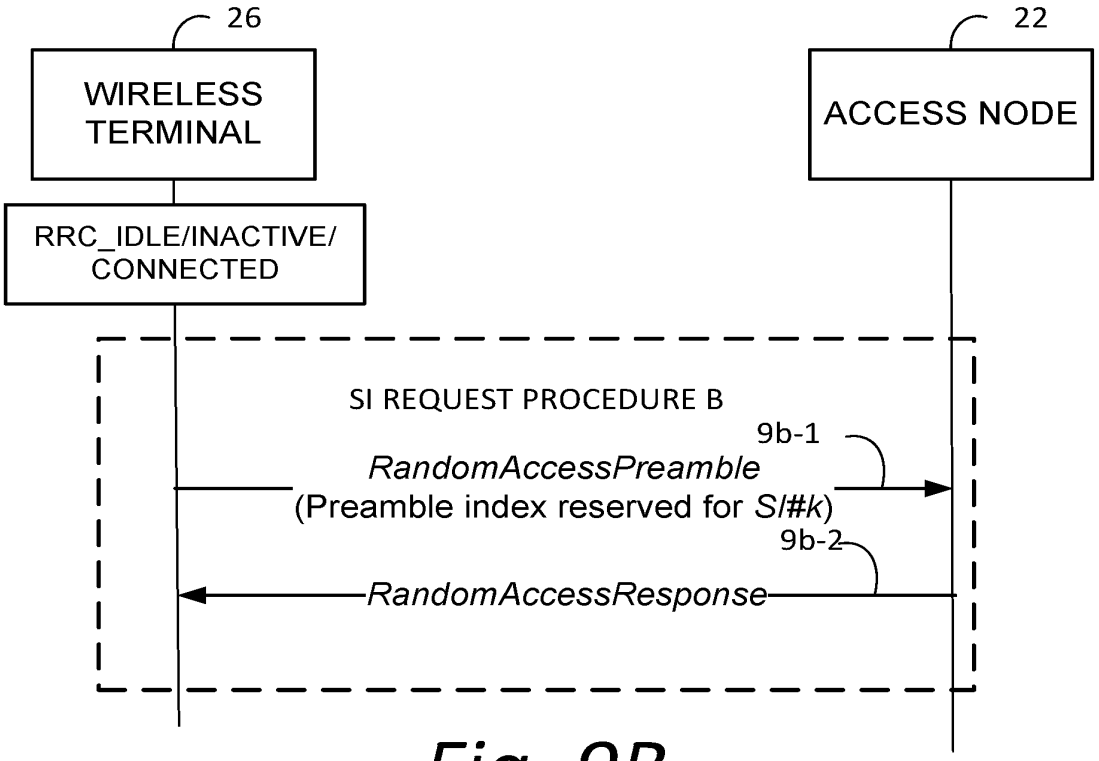

26
WIRELESS TERMINAL
22
ACCESS NODE
RRC_IDLE/INACTIVE/ CONNECTED
SI REQUEST PROCEDURE B
9b-1
RandomAccessPreamble
(Preamble index reserved for SI#k)
9b-2
RandomAccessResponse

Fig. 9B

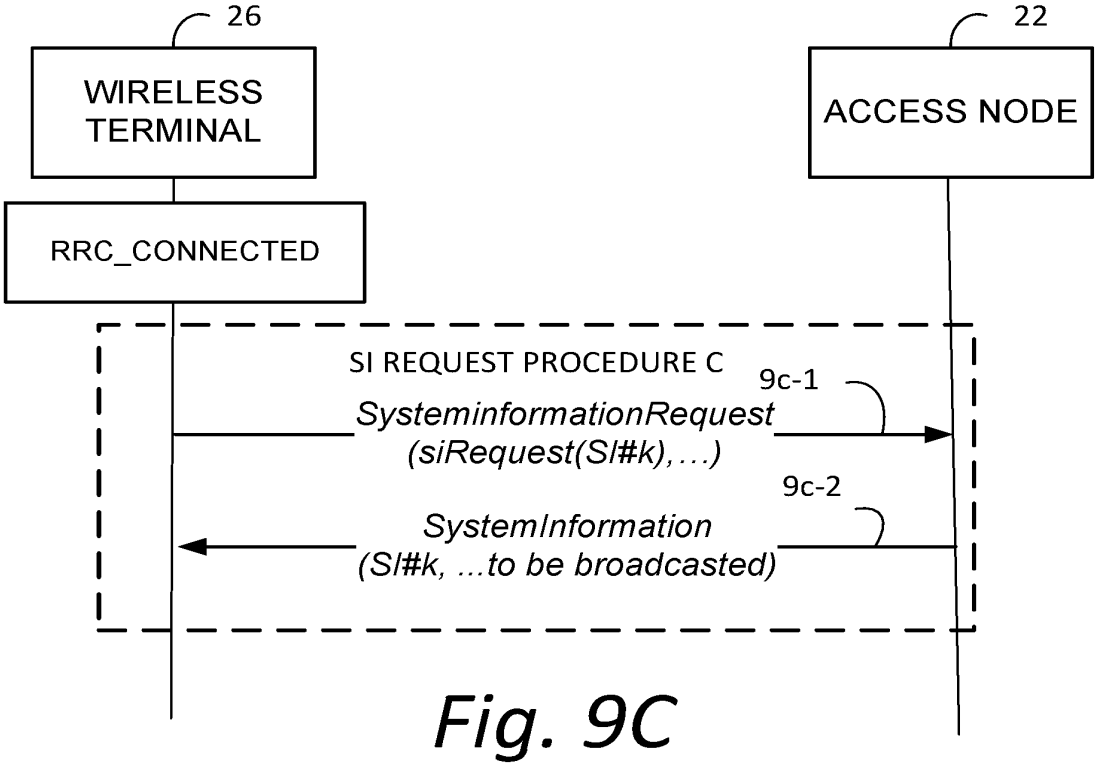

26
WIRELESS TERMINAL
22
ACCESS NODE
RRC_CONNECTED
SI REQUEST PROCEDURE C
9c-1
SysteminformationRequest
(siRequest(SI#k),…)
9c-2
SystemInformation
(SI#k, …to be broadcasted)

Fig. 9C

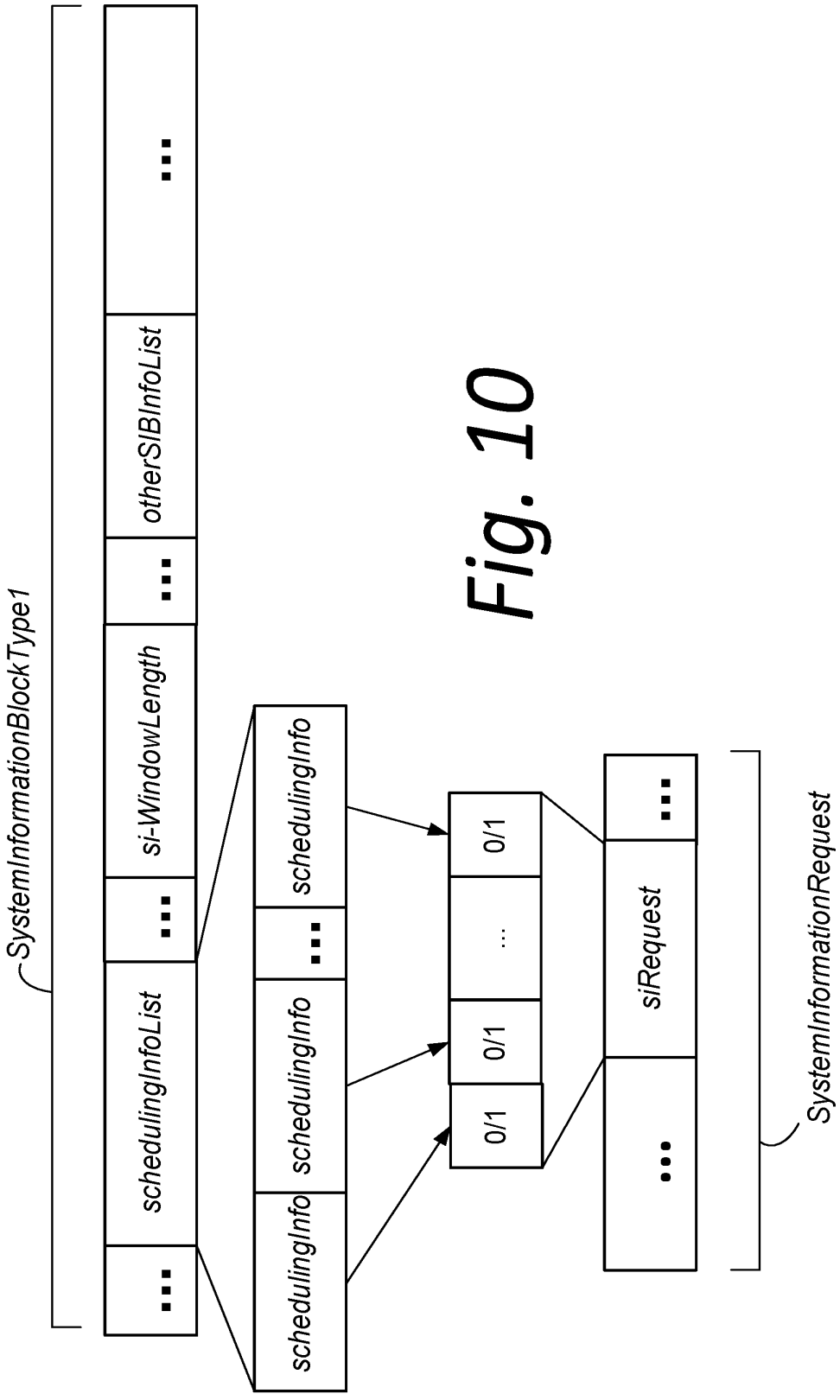

SystemInformationBlockType1
schedulingInfoList
si-WindowLength
otherSIBInfoList
schedulingInfo
schedulingInfo
schedulingInfo
0/1
0/1
0/1
siRequest
SystemInformationRequest

Fig. 10

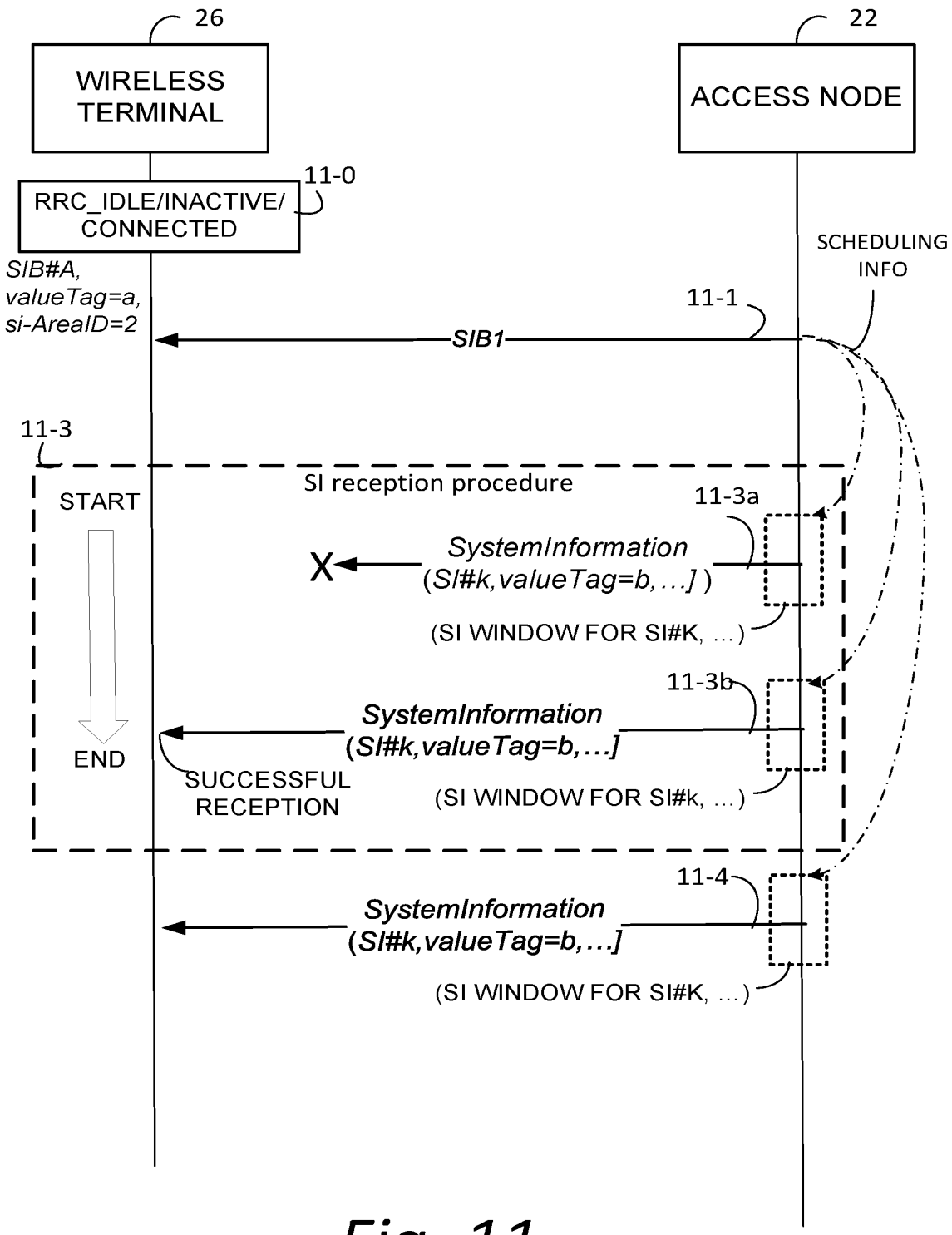

26
WIRELESS TERMINAL
22
ACCESS NODE
11-0
RRC_IDLE/INACTIVE/ CONNECTED
SIB#A, valueTag=a, si-AreaID=2
SCHEDULING INFO
11-1
SIB1
11-3
SI reception procedure
START
11-3a
SystemInformation (SI#k,valueTag=b,…])
X
(SI WINDOW FOR SI#K, …)
11-3b
SystemInformation (SI#k,valueTag=b,…]
END
SUCCESSFUL RECEPTION
(SI WINDOW FOR SI#k, …)
11-4
SystemInformation (SI#k,valueTag=b,…]
(SI WINDOW FOR SI#K, …)

Fig. 11

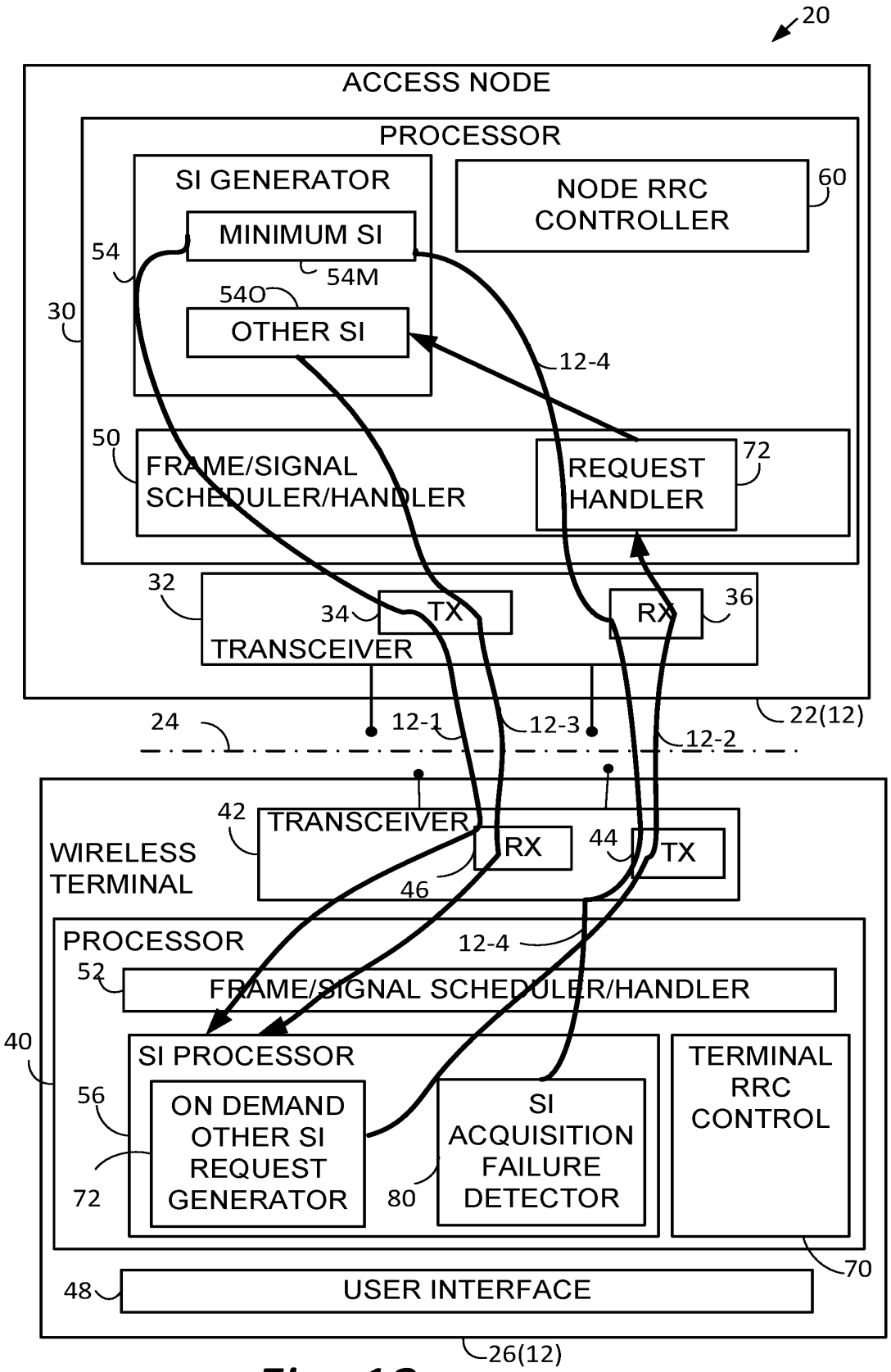

20
ACCESS NODE
PROCESSOR
SI GENERATOR
MINIMUM SI
54M
54O
OTHER SI
54
30
NODE RRC CONTROLLER
60
12-4
50
FRAME/SIGNAL SCHEDULER/HANDLER
REQUEST HANDLER
72
32
34
TX
RX
36
TRANSCEIVER
22(12)
24
12-1
12-3
12-2
42
TRANSCEIVER
RX
44
TX
46
WIRELESS TERMINAL
PROCESSOR
12-4
52
FRAME/SIGNAL SCHEDULER/HANDLER
40
SI PROCESSOR
56
ON DEMAND OTHER SI REQUEST GENERATOR
72
SI ACQUISITION FAILURE DETECTOR
80
TERMINAL RRC CONTROL
70
48
USER INTERFACE
26(12)

Fig. 12

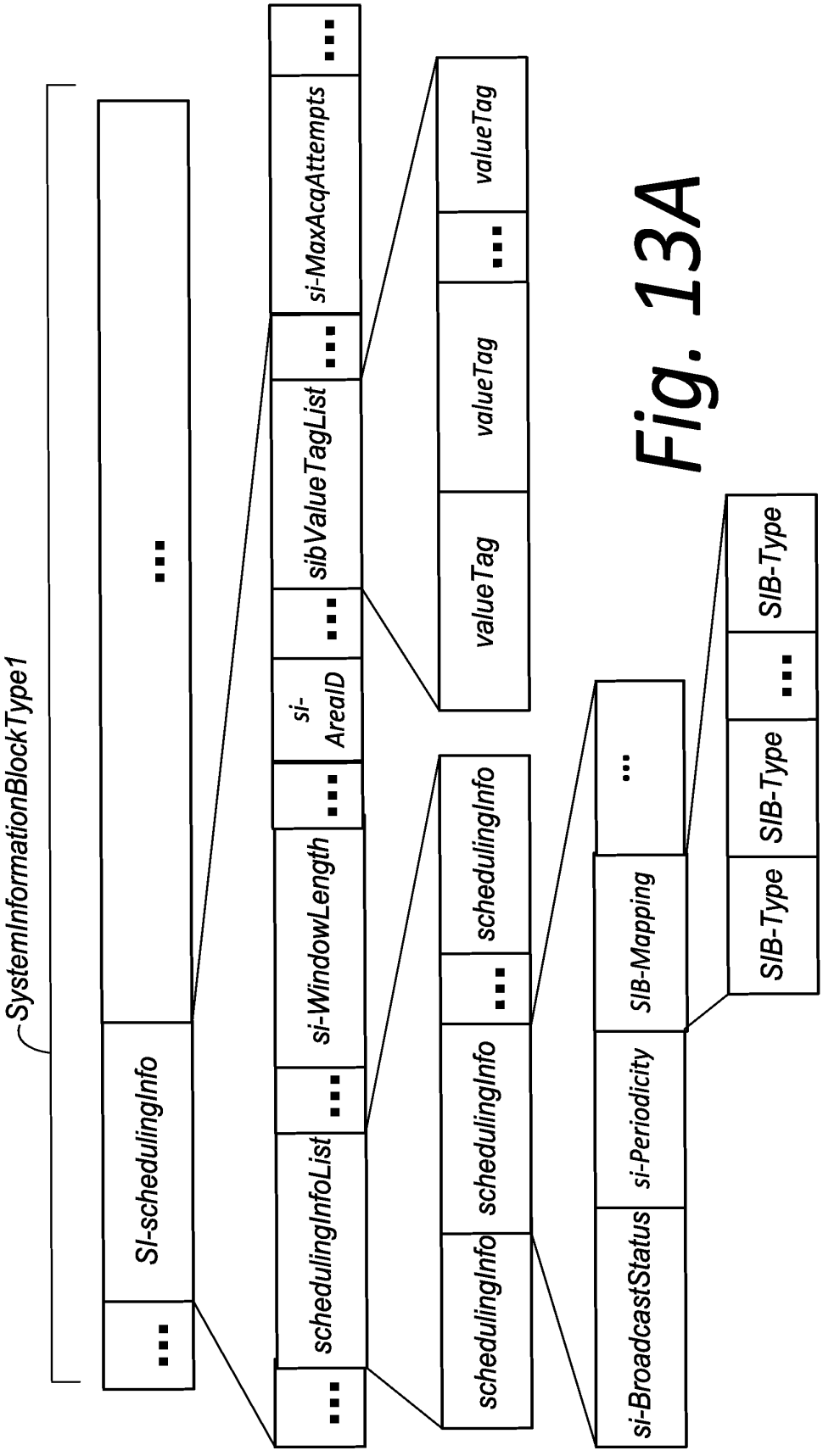

SystemInformationBlockType1
SI-schedulingInfo
schedulingInfoList
si-WindowLength
si-ArealD
sibValueTagList
si-MaxAcqAttempts
valueTag
valueTag
valueTag
schedulingInfo
schedulingInfo
schedulingInfo
SIB-Mapping
si-Periodicity
si-BroadcastStatus
SIB-Type
SIB-Type
SIB-Type

Fig. 13A

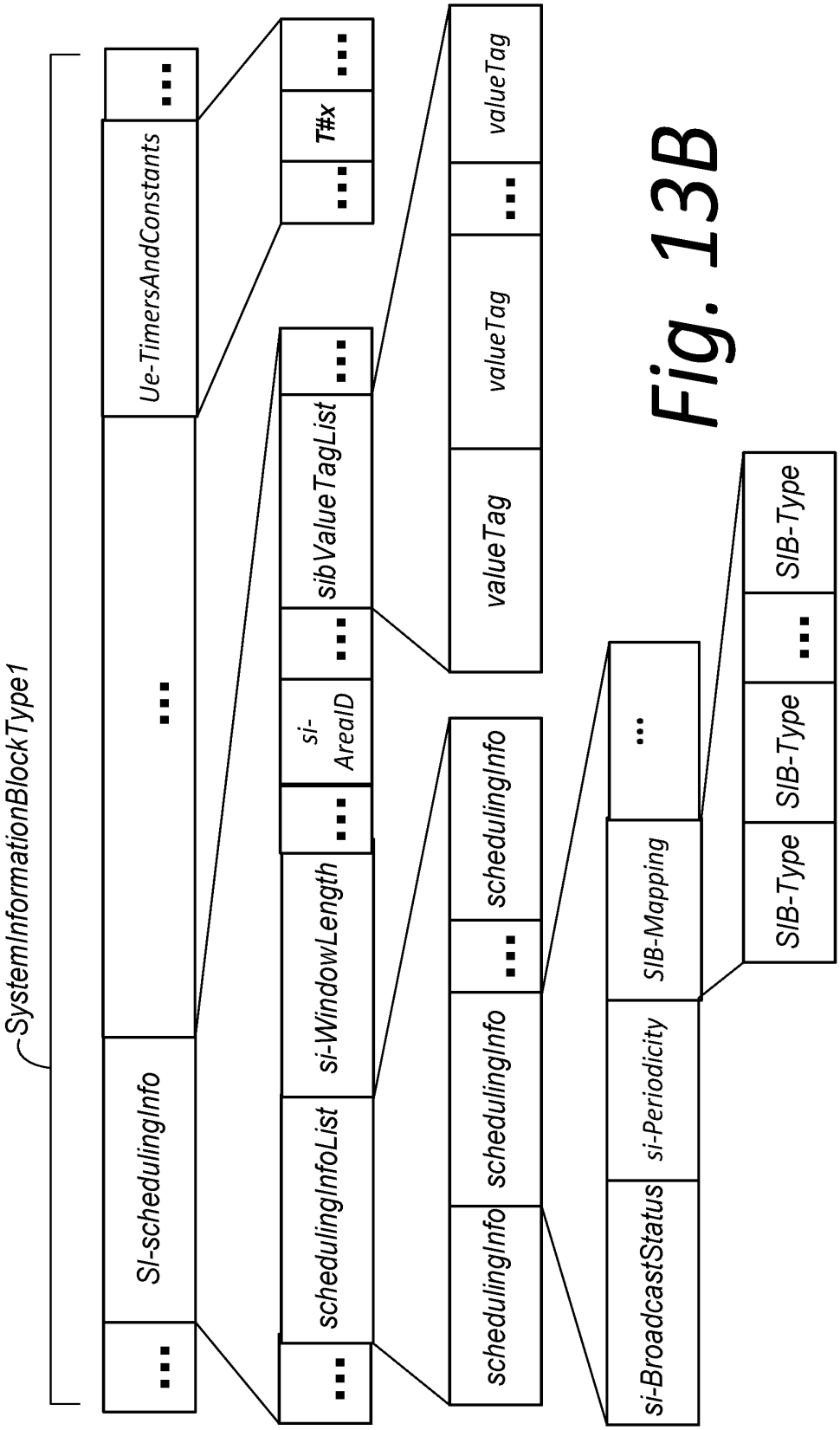

SystemInformationBlockType1
SI-schedulingInfo
Ue-TimersAndConstants
T#x
schedulingInfoList
si-WindowLength
si-AreaID
sibValueTagList
valueTag
schedulingInfo
si-BroadcastStatus
si-Periodicity
SIB-Mapping
SIB-Type

Fig. 13B

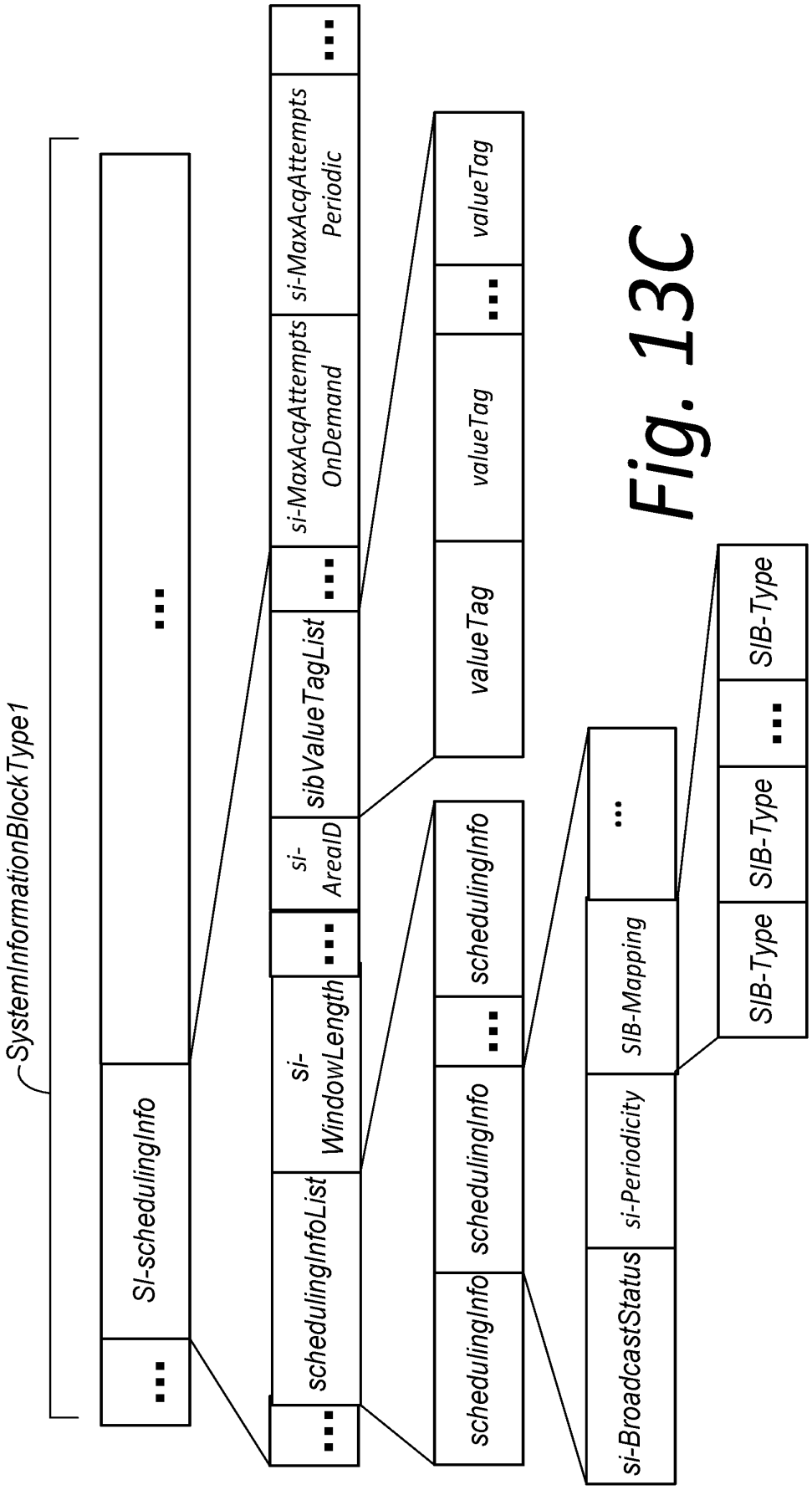

SystemInformationBlockType1
SI-schedulingInfo
schedulingInfoList
si-WindowLength
si-AreaID
sibValueTagList
si-MaxAcqAttempts OnDemand
si-MaxAcqAttempts Periodic
valueTag
schedulingInfo
si-BroadcastStatus
si-Periodicity
SIB-Mapping
SIB-Type

Fig. 13C

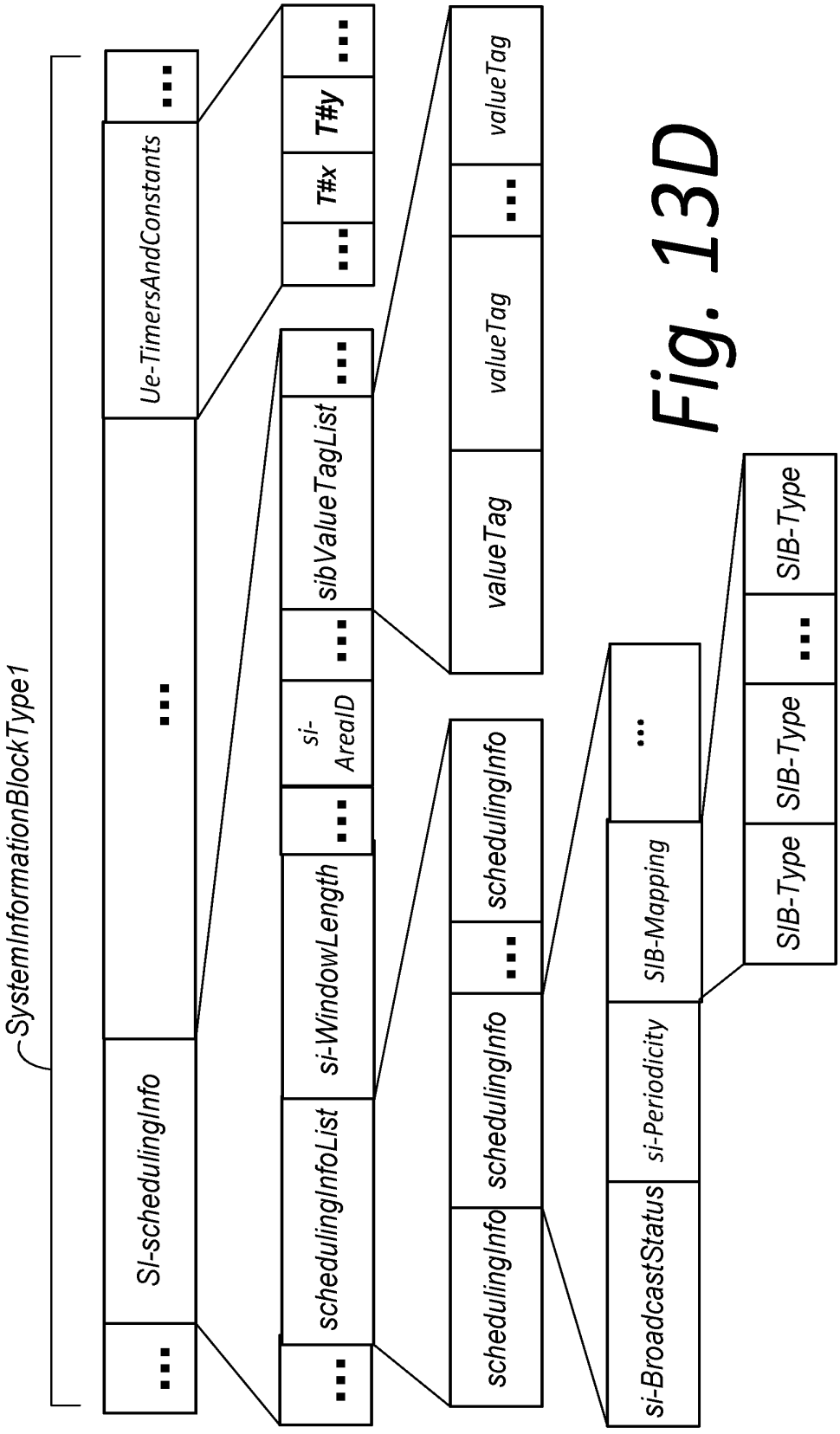

SystemInformationBlockType1
Ue-TimersAndConstants
SI-schedulingInfo
schedulingInfoList
si-WindowLength
si-AreaID
sibValueTagList
T#x
T#y
valueTag
schedulingInfo
si-BroadcastStatus
si-Periodicity
SIB-Mapping
SIB-Type

Fig. 13D

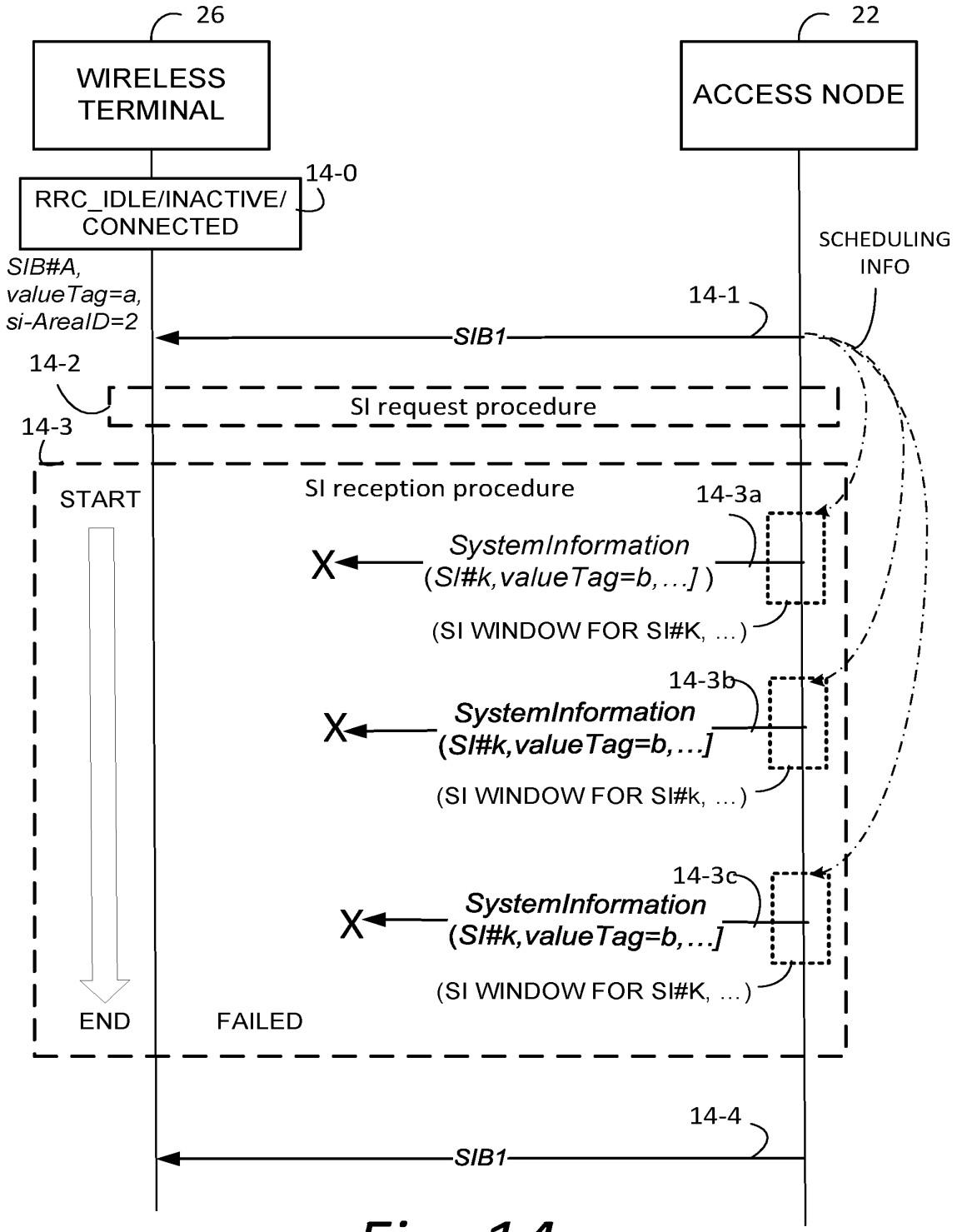

26
WIRELESS TERMINAL
22
ACCESS NODE
14-0
RRC_IDLE/INACTIVE/ CONNECTED
SCHEDULING INFO
SIB#A, valueTag=a, si-AreaID=2
14-1
SIB1
14-2
SI request procedure
14-3
START
SI reception procedure
14-3a
SystemInformation (SI#k,valueTag=b,…])
(SI WINDOW FOR SI#K, …)
14-3b
SystemInformation (SI#k,valueTag=b,…]
(SI WINDOW FOR SI#k, …)
14-3c
SystemInformation (SI#k,valueTag=b,…]
(SI WINDOW FOR SI#K, …)
END
FAILED
14-4
SIB1

Fig. 14

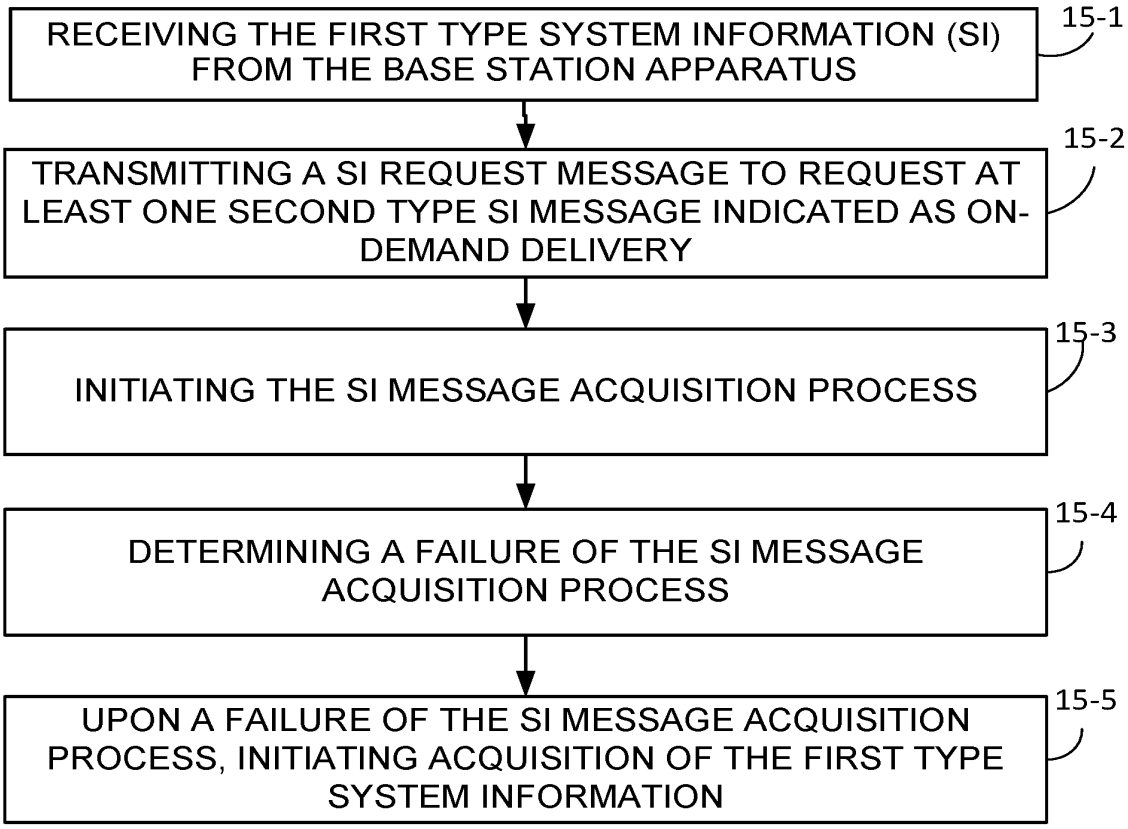

RECEIVING THE FIRST TYPE SYSTEM INFORMATION (SI) FROM THE BASE STATION APPARATUS
15-1
TRANSMITTING A SI REQUEST MESSAGE TO REQUEST AT LEAST ONE SECOND TYPE SI MESSAGE INDICATED AS ON-DEMAND DELIVERY
15-2
INITIATING THE SI MESSAGE ACQUISITION PROCESS
15-3
DETERMINING A FAILURE OF THE SI MESSAGE ACQUISITION PROCESS
15-4
UPON A FAILURE OF THE SI MESSAGE ACQUISITION PROCESS, INITIATING ACQUISITION OF THE FIRST TYPE SYSTEM INFORMATION
15-5

Fig. 15

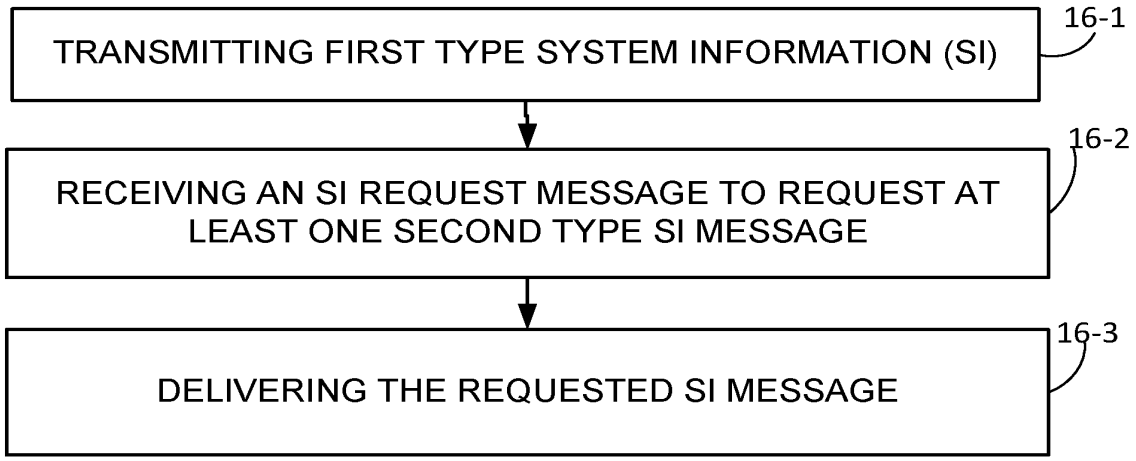

TRANSMITTING FIRST TYPE SYSTEM INFORMATION (SI)
16-1
RECEIVING AN SI REQUEST MESSAGE TO REQUEST AT LEAST ONE SECOND TYPE SI MESSAGE
16-2
DELIVERING THE REQUESTED SI MESSAGE
16-3

Fig. 16

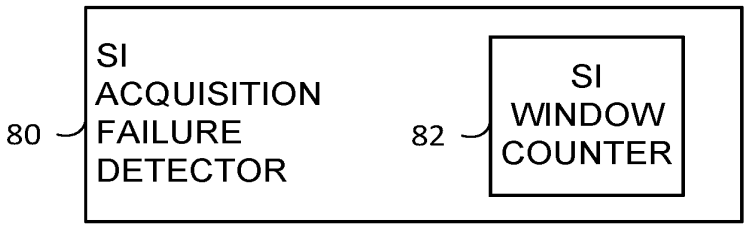


Fig. 17A

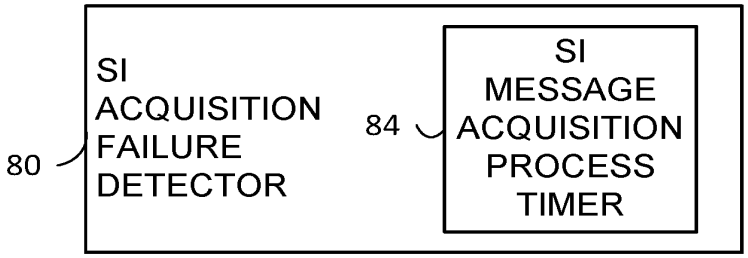


Fig. 17B

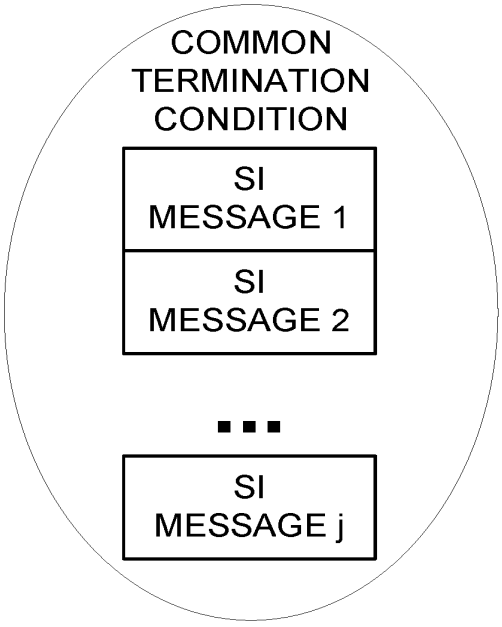


Fig. 18A

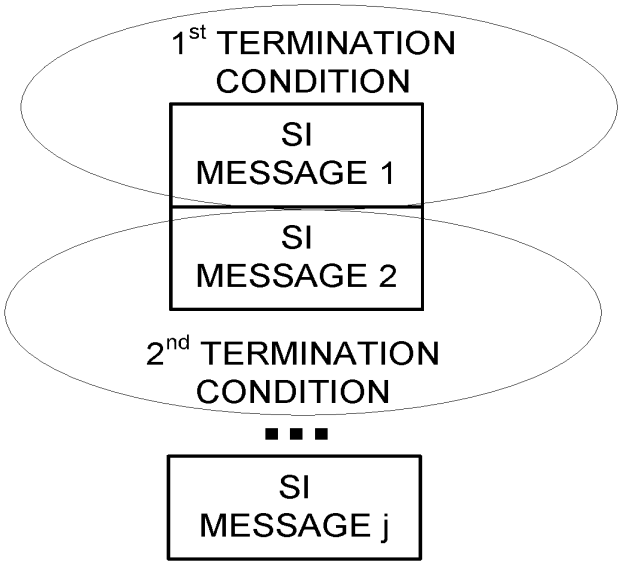


Fig. 18B

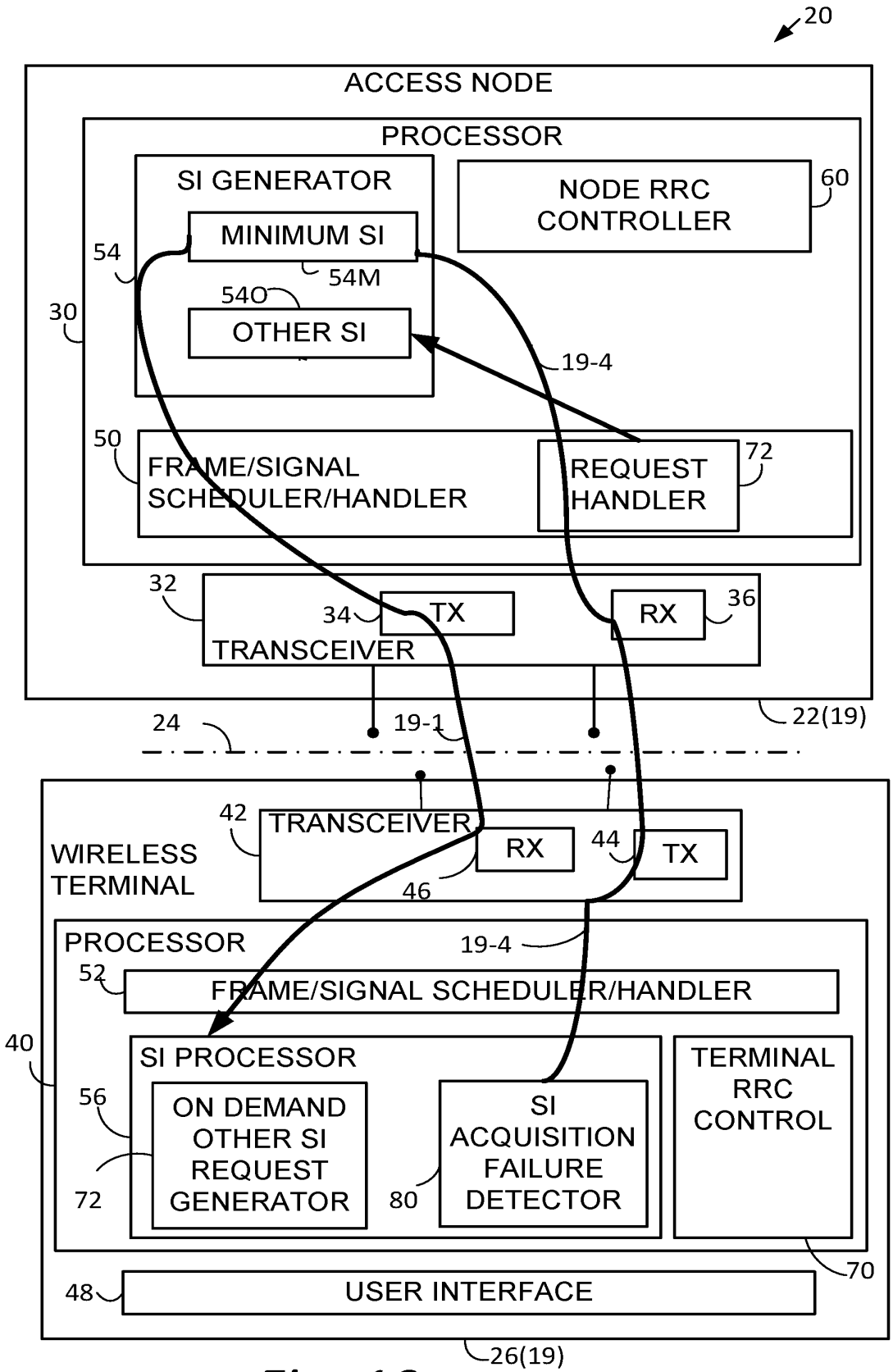

20
ACCESS NODE
PROCESSOR
SI GENERATOR
MINIMUM SI
54
54M
54O
OTHER SI
30
NODE RRC CONTROLLER
60
19-4
50
FRAME/SIGNAL SCHEDULER/HANDLER
REQUEST HANDLER
72
32
34
TX
RX
36
TRANSCEIVER
22(19)
24
19-1
42
TRANSCEIVER
RX
44
TX
46
WIRELESS TERMINAL
PROCESSOR
19-4
52
FRAME/SIGNAL SCHEDULER/HANDLER
40
SI PROCESSOR
56
ON DEMAND OTHER SI REQUEST GENERATOR
72
SI ACQUISITION FAILURE DETECTOR
80
TERMINAL RRC CONTROL
70
48
USER INTERFACE
26(19)

Fig. 19

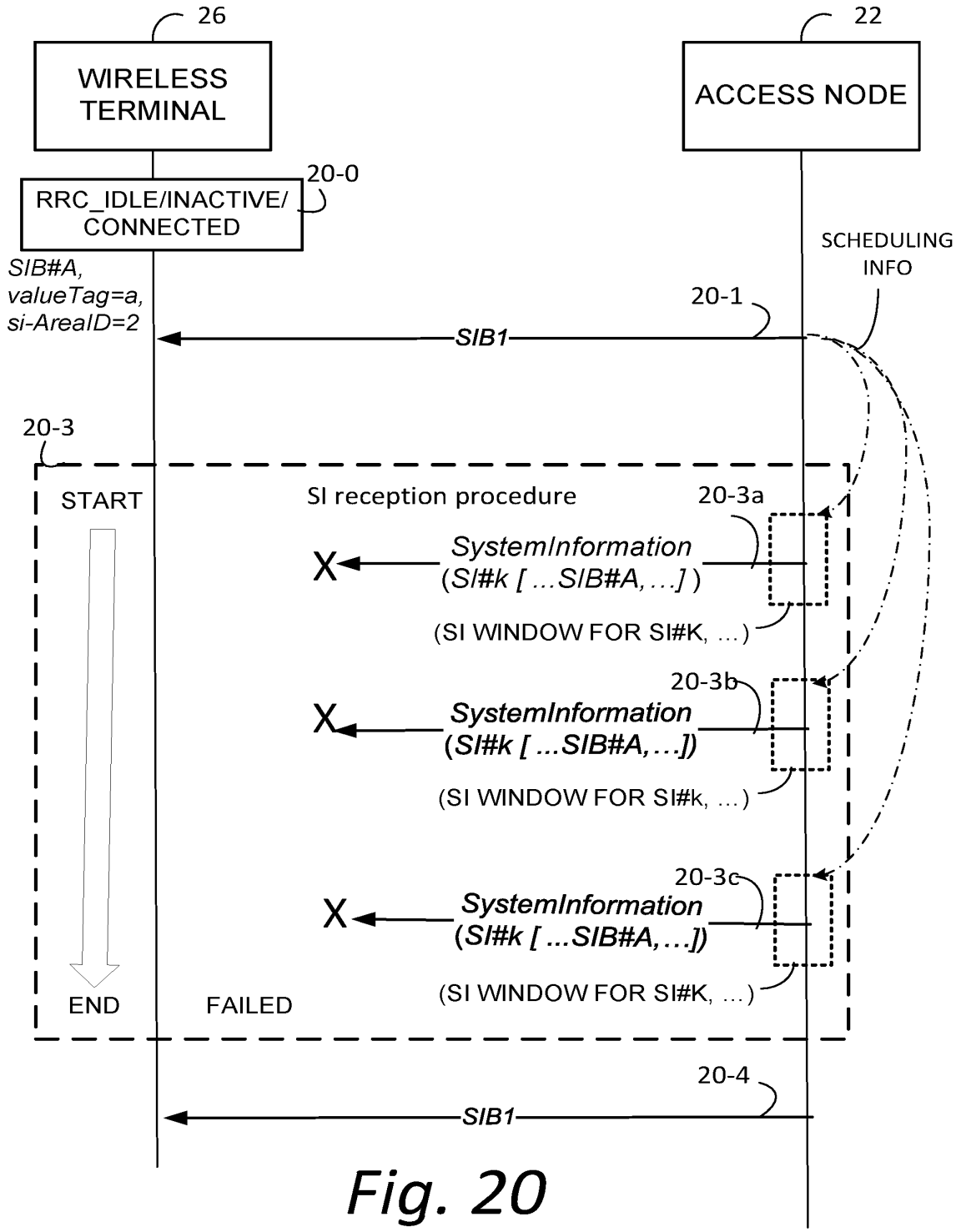

26
WIRELESS TERMINAL
22
ACCESS NODE
20-0
RRC_IDLE/INACTIVE/ CONNECTED
SCHEDULING INFO
SIB#A, valueTag=a, si-AreaID=2
20-1
SIB1
20-3
START
SI reception procedure
20-3a
SystemInformation (SI#k [...SIB#A,...])
(SI WINDOW FOR SI#K, ...)
20-3b
SystemInformation (SI#k [...SIB#A,...])
(SI WINDOW FOR SI#k, ...)
20-3c
SystemInformation (SI#k [...SIB#A,...])
(SI WINDOW FOR SI#K, ...)
END
FAILED
20-4
SIB1

Fig. 20

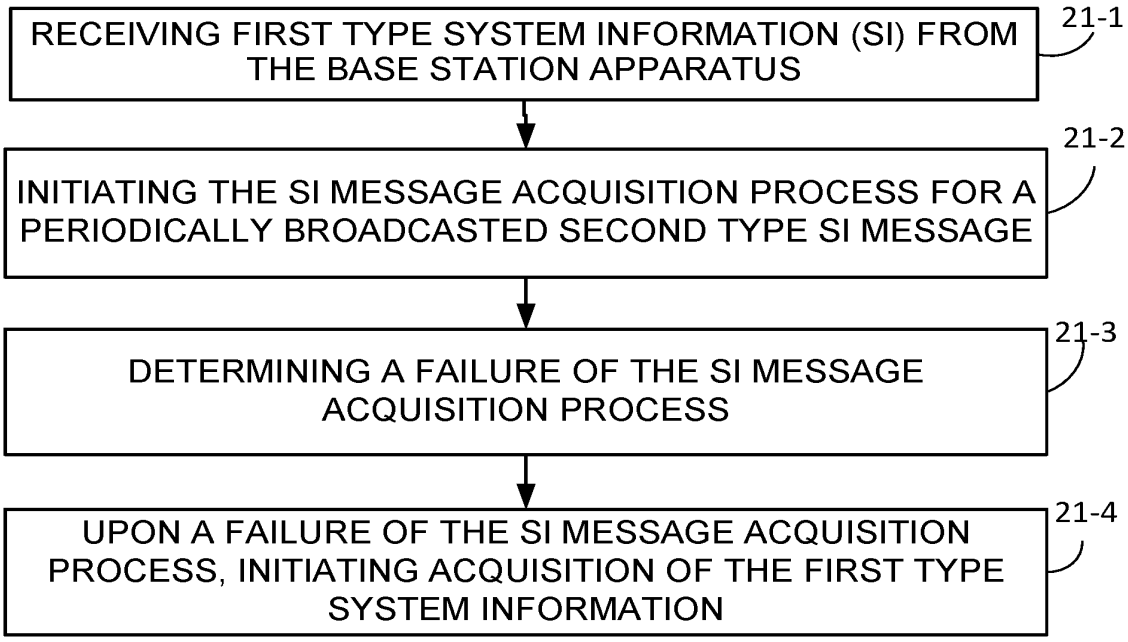

RECEIVING FIRST TYPE SYSTEM INFORMATION (SI) FROM THE BASE STATION APPARATUS
21-1
INITIATING THE SI MESSAGE ACQUISITION PROCESS FOR A PERIODICALLY BROADCASTED SECOND TYPE SI MESSAGE
21-2
DETERMINING A FAILURE OF THE SI MESSAGE ACQUISITION PROCESS
21-3
UPON A FAILURE OF THE SI MESSAGE ACQUISITION PROCESS, INITIATING ACQUISITION OF THE FIRST TYPE SYSTEM INFORMATION
21-4

Fig. 21

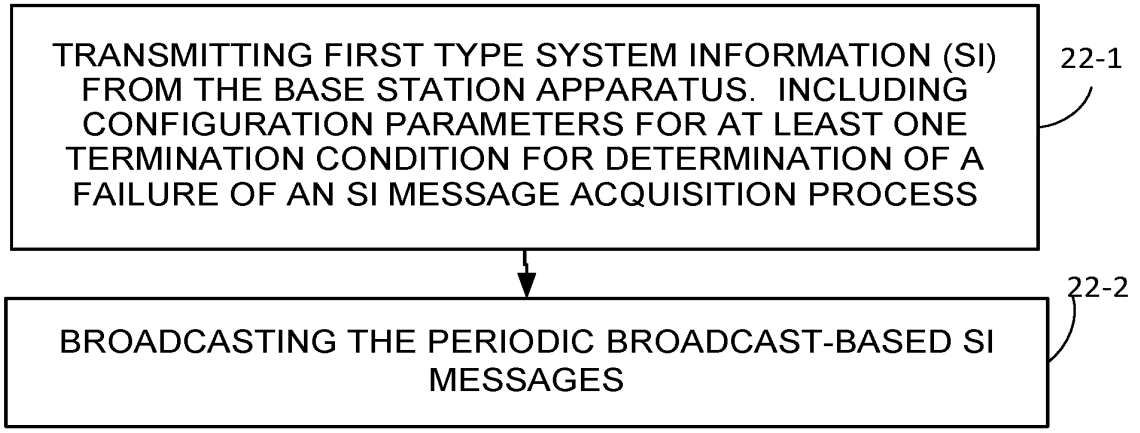

TRANSMITTING FIRST TYPE SYSTEM INFORMATION (SI) FROM THE BASE STATION APPARATUS. INCLUDING CONFIGURATION PARAMETERS FOR AT LEAST ONE TERMINATION CONDITION FOR DETERMINATION OF A FAILURE OF AN SI MESSAGE ACQUISITION PROCESS
22-1
BROADCASTING THE PERIODIC BROADCAST-BASED SI MESSAGES
22-2

Fig. 22

ABSTRACT OF THE DISCLOSURE

[000186] A user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN) comprises processor circuitry and receiver circuitry. The processor circuitry is configured to initiate a first type system information block (SIB) acquisition process to receive a first type SIB. The first type SIB comprises scheduling information of a second type SI message, the second type SI message comprising at least one system information block (SIB); and an indication of broadcast status for the second type SI message, the indication indicating broadcasting. The receiver circuitry is configured to receive the first type SIB. The processor circuitry is further configured to initiate an SI message acquisition process to receive the SI message. In a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

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WHAT IS CLAIMED IS:

1. A user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the user equipment comprising:

processor circuitry configured to initiate a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising:

scheduling information of a second type SI message, the second type SI message comprising at least one system information block (SIB); and

an indication of broadcast status for the second type SI message, the indication indicating broadcasting;

receiver circuitry configured to receive the first type SIB; and

the processor circuitry further configured to initiate an SI message acquisition process to receive the SI message; wherein

in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

2. The user equipment of claim 1, wherein the processor circuitry is further configured to re-initiate the SI message acquisition process based on the first type SIB acquisition process being initiated upon the failure of the SI message acquisition process.

3. A method for a user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the method comprising:

initiating a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and

an indication of broadcast status for the SI message, the indication indicating broadcasting;

receiving the first type SIB; and

initiating an SI message acquisition process to receive the SI message; wherein

in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

4. The method of claim 3, further comprising re-initiating the SI message acquisition process based on the first type SIB acquisition process being initiated upon the failure of the SI message acquisition process.

5. A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:

transmitter circuitry configured to transmit first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB;

an indication of broadcast status for the SI message, the indication indicating broadcasting;

processor circuitry configured to use the transmitter circuitry to broadcast the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid.

6. The base station apparatus of claim 5, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

7. A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, comprising:

transmitting first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and

an indication of broadcast status for the second type SI message, the indication indicating broadcasting;

broadcasting the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid.

8. The method of claim 7, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATIONS

This application is a continuation of PCT application PCT/US2019/031674, filed 2019 May 10, and claims the priority and benefit of US provisional application 62/669,851, filed May 10, 2018, both of which are entitled "APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED INFORMATION IN WIRELESS COMMUNICATIONS" and both of which are incorporated herein by reference in their entirety.

TECHNICAL FIELD

[0001] The technology relates to wireless communications, and particularly to methods, apparatus, and techniques for requesting, transmitting, updating, and using system information (SI) in wireless communications.

BACKGROUND

[0002] In wireless communication systems, a radio access network generally comprises one or more access nodes (such as a base station) which communicate on radio channels over a radio or air interface with plural wireless terminals. In some technologies such a wireless terminal is also called a User Equipment (UE). A group known as the 3rd Generation Partnership Project ("3GPP") has undertaken to define globally applicable technical specifications and technical reports for present and future generation wireless communication systems. The 3GPP Long Term Evolution ("LTE") and 3GPP LTE Advanced (LTE-A) are projects to improve an earlier Universal Mobile Telecommunications System ("UMTS") mobile phone or device standard in a manner to cope with future requirements.

[0003] In typical cellular mobile communication systems, the base station broadcasts on the radio channels certain information which is required for mobile stations to access to the

network. In Long-Term Evolution (LTE) and LTE Advanced (LTE-A), such information is called "system information" ("SI"). Each access node, such as an evolved NodeB ("eNB") or a gNB in the 5G New Radio (NR) System, broadcasts such system information to its coverage area via a Master Information Block (MIB) and several System Information Blocks (SIBs) on downlink radio resources allocated to the access node.

[0004] A wireless terminal ("UE"), after entering a coverage area of an eNB or gNB, is required to obtain all the MIB/SIBs which are necessary to access to the system. For sake of UEs under coverage, the eNB or gNB periodically broadcasts all MIB/SIBs relevant for offered services, where each type of MIB or SIBs is transmitted in a designated radio resource(s) with its own pre-determined/configurable frequency.

[0005] This all-broadcast-based periodic delivery method (e.g., collective broadcast of all SIBs, not just those necessary for system access) is efficient under a condition where many UEs are almost always flowing into the coverage area (such as a macro cell). However, this approach may result in wasting valuable radio resources in case of small cell deployment. Therefore, more efficient methods of SIB transmission are desired.

[0006] What is needed, therefore, and an example object of the technology disclosed herein, are methods, apparatus, and techniques for obtaining and/or updating SIBs in/of Other SI (Other SI SIBs), and also for making a determination of SI message acquisition process failure and remedial processes therefor.

SUMMARY

[0007] In one of its example aspects the technology disclosed herein concerns a wireless terminal which communicates over a radio interface with an access node of a radio access network (RAN). In an example basic embodiment the wireless terminal comprises processor circuitry and receiver circuitry. The processor circuitry is configured to initiate a first type system information block (SIB) acquisition process to receive a first type SIB. The first type SIB comprises scheduling information of a second type SI message, the second type SI message comprising at least one system information block (SIB); and an indication of broadcast status for the second type SI message, the indication indicating broadcasting. The

receiver circuitry is configured to receive the first type SIB. The processor circuitry is further configured to initiate an SI message acquisition process to receive the SI message. In a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

[0008] In another of its example aspects the technology disclosed herein concerns method in a user equipmentuser equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN). In a basic mode, the method comprises initiating a first type system information block (SIB) acquisition process to receive a first type SIB, receiving the first type SIB; and initiating an SI message acquisition process to receive the SI message. In a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process. The first type SIB comprises scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and an indication of broadcast status for the SI message, the indication indicating broadcasting.

[0009] In another of its example aspects the technology disclosed herein concerns a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment. In a basic example embodiment and mode the base station apparatus comprises transmitter circuitry and processor circuitry. The transmitter circuitry is configured to transmit first type system information block (SIB). The first type SIB comprises scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB and an indication of broadcast status for the SI message, the indication indicating broadcasting. The processor circuitry is configured to use the transmitter circuitry to broadcast the SI message. The first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid.

[00010] In another of its example aspects the technology disclosed herein concerns method in a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment. In a basic mode, the method comprises transmitting first

type system information block (SIB) and broadcasting the SI message. The first type SIB comprises scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and an indication of broadcast status for the second type SI message, the indication indicating broadcasting. According to the method, the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid.

BRIEF DESCRIPTION OF THE DRAWINGS

[00011] The foregoing and other objects, features, and advantages of the technology disclosed herein will be apparent from the following more particular description of preferred embodiments as illustrated in the accompanying drawings in which reference characters refer to the same parts throughout the various views. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the technology disclosed herein.

[00012] Fig. 1 is a diagrammatic view showing transition states of a Radio Resource Control RRC state machine.

[00013] Fig. 2 is a schematic view showing an example generic communications system comprising a radio access node and a wireless terminal, wherein the wireless terminal requests, and the radio access node provides, Other system information (Other SI) when the wireless terminal is in a RRC_CONNECTED state.

[00014] Fig. 3 is a flowchart showing example, basic example acts or steps performed by a wireless terminal of the example generic communications system of Fig. 2.

[00015] Fig. 4 – Fig. 7 are diagrammatic views illustrating differing example formats of a system information block (SIB) which comprises Minimal SI and which carries availability of Other system information (Other SI).

[00016] Fig. 8 is a diagrammatic view illustrating an exemplary message flow of on-demand based SI acquisition procedure.

[00017] Fig. 9A, Fig. 9B and Fig. 9C are diagrammatic views illustrating three options for an SI request procedure.

[00018] Fig. 10 is a diagrammatic view showing, e.g., a *SystemInformationRequest* message wherein a *siRequest* information element comprises a bit map.

[00019] Fig. 11 is a diagrammatic view illustrating an exemplary message flow of periodic broadcast based SI acquisition procedure.

[00020] Fig. 12 is a schematic view showing an example generic communications system comprising a wireless terminal configured to detect failure of a SI reception process involving an on-demand SI message, following a successful completion of an SI request.

[00021] Fig. 13A – Fig. 13D are diagrammatic view of differing implementations of SIB1 which comprise termination condition parameters.

[00022] Fig. 14 is a diagrammatic view illustrating an exemplary message flow including an on-demand based SI acquisition procedure which fails.

[00023] Fig. 15 is a flowchart showing basic, representative, example acts or steps performed by the wireless terminal of Fig. 12.

[00024] Fig. 16 is a flowchart showing basic, representative, example acts or steps performed by the access node of Fig. 12.

[00025] Fig. 17A is a diagrammatic view of a system information acquisition failure detector which comprises a SI window counter for making a determination of SI message acquisition process termination.

[00026] Fig. 17B is a diagrammatic view of a system information acquisition failure detector which comprises a SI message acquisition process timer for making a determination of SI message acquisition process termination.

[00027] Fig. 18A is a diagrammatic view showing a common termination condition for plural SI messages.

[00028] Fig. 18B is a diagrammatic view showing different termination conditions for different SI messages.

[00029] Fig. 19 is a schematic view showing an example generic communications system comprising a wireless terminal configured to detect failure of a SI reception process involving a periodically broadcasted SI message.

[00030] Fig. 20 is a diagrammatic view illustrating an exemplary message flow including a failed SI acquisition procedure for a periodically broadcasted SI message.

[00031] Fig. 21 is a flowchart showing basic, representative, example acts or steps performed by the wireless terminal of Fig. 19.

[00032] Fig. 22 is a flowchart showing basic, representative, example acts or steps performed by the access node of Fig. 19.

[00033] Fig. 23 is a diagrammatic view showing example electronic machinery which may comprise node electronic machinery or terminal electronic machinery.

DETAILED DESCRIPTION

[00034] In the following description, for purposes of explanation and not limitation, specific details are set forth such as particular architectures, interfaces, techniques, etc. in order to provide a thorough understanding of the technology disclosed herein. However, it will be apparent to those skilled in the art that the technology disclosed herein may be practiced in other embodiments that depart from these specific details. That is, those skilled in the art will

be able to devise various arrangements which, although not explicitly described or shown herein, embody the principles of the technology disclosed herein and are included within its spirit and scope. In some instances, detailed descriptions of well-known devices, circuits, and methods are omitted so as not to obscure the description of the technology disclosed herein with unnecessary detail. All statements herein reciting principles, aspects, and embodiments of the technology disclosed herein, as well as specific examples thereof, are intended to encompass both structural and functional equivalents thereof. Additionally, it is intended that such equivalents include both currently known equivalents as well as equivalents developed in the future, i.e., any elements developed that perform the same function, regardless of structure.

[00035] Thus, for example, it will be appreciated by those skilled in the art that block diagrams herein can represent conceptual views of illustrative circuitry or other functional units embodying the principles of the technology. Similarly, it will be appreciated that any flow charts, state transition diagrams, pseudocode, and the like represent various processes which may be substantially represented in computer readable medium and so executed by a computer or processor, whether or not such computer or processor is explicitly shown.

[00036] As used herein, the term "core network" can refer to a device, group of devices, or sub-system in a telecommunication network that provides services to users of the telecommunications network. Examples of services provided by a core network include aggregation, authentication, call switching, service invocation, gateways to other networks, etc.

[00037] As used herein, the term "wireless terminal" can refer to any electronic device used to communicate voice and/or data via a telecommunications system, such as (but not limited to) a cellular network. Other terminology used to refer to wireless terminals and non-limiting examples of such devices can include user equipment terminal, UE, mobile station, mobile device, access terminal, subscriber station, mobile terminal, remote station, user terminal, terminal, subscriber unit, cellular phones, smart phones, personal digital assistants ("PDAs"), laptop computers, netbooks, e-readers, wireless modems, etc.

[00038] As used herein, the term "access node", "node", or "base station" can refer to any device or group of devices that facilitates wireless communication or otherwise provides an

interface between a wireless terminal and a telecommunications system. A non-limiting example of a base station can include, in the 3GPP specification, a Node B ("NB"), an enhanced Node B ("eNB"), a home eNB ("HeNB") , a 5G (New Radio [NR]) gNB, or some other similar terminology. Another non-limiting example of a base station is an access point. An access point may be an electronic device that provides access for wireless terminal to a data network, such as (but not limited to) a Local Area Network ("LAN"), Wide Area Network ("WAN"), the Internet, etc. Although some examples of the systems and methods disclosed herein may be described in relation to given standards (e.g., 3GPP Releases 8, 9, 10, 11, 12, or higher), the scope of the present disclosure should not be limited in this regard. At least some aspects of the systems and methods disclosed herein may be utilized in other types of wireless communication systems.

[00039] As used herein, the term "telecommunication system" or "communications system" can refer to any network of devices used to transmit information. A non-limiting example of a telecommunication system is a cellular network or other wireless communication system.

[00040] As used herein, the term "cellular network" can refer to a network distributed over cells, each cell served by at least one fixed-location transceiver, such as a base station. A "cell" may be any communication channel that is specified by standardization or regulatory bodies to be used for International Mobile Telecommunications-Advanced ("IMTAdvanced"). All or a subset of the cell may be adopted by 3GPP as licensed bands (e.g., frequency band) to be used for communication between a base station, such as a Node B, and a UE terminal. A cellular network using licensed frequency bands can include configured cells. Configured cells can include cells of which a UE terminal is aware and in which it is allowed by a base station to transmit or receive information.

[00041] As used herein, "system information" ("SI") may include a Master Information Block (MIB) and several System Information Blocks (SIBs) which are provided on downlink radio resources allocated to an access node. The system information may be broadcast, and some types of system information may be provided on demand, e.g., upon receipt of a request for system information from a wireless terminal.

[00042] In various aspects of the technology disclosed herein, system information is classified into plural categories or types. In an example embodiment and mode, a first type of the system information is Minimum System Information (Minimum SI), minimally containing information required for UEs initially access to the network, periodically broadcasted by each access node (e.g. eNB for LTE, gNB for 5G Radio System). In some configurations, Minimum System SI may consist of MIB and a limited number of SIBs. The MIB may contain essential information for the radio system to help wireless terminals to synchronize to the serving access node and may also contain instruction how to obtain at least one of the essential SIBs. The Minimum SI may be also referred as "essential SI", or first type system information.

[00043] A second type of system information, e.g., "Other system information, "Other SI", or second type system information contains all the other types of information, i.e., all types of system information except the Minimum System Information. The Other SI may comprise several system information blocks (SIBs) that are not categorized as Minimum SI. The Other SI may be also referred as "non-essential SI". However, the second type system information is not to be confused with SIB Type 2, which is a particular (second) system information block (SIB) that may be included in the Minimum System Information or may be a part of the Other SI.

[00044] In some example embodiment and modes described herein, for each of the SIBs the access node may choose to broadcast the SIB periodically, similar to the SIBs in Minimum SI. Alternatively, the access node may choose to refrain from transmitting the SIB until receiving a request of on-demand delivery from a UE. In this case, the access node may advertise the availability of on-demand delivery using Minimum SI.

[00045] As described herein, both an access node and a wireless terminal may manage respective Radio Resource Control (RRC) state machines. The RRC state machines transition between several RRC states including RRC_IDLE, RRC_INACTIVE and RRC_CONNECTED. Fig. 1 depicts the state transition diagram of the RRC states. From the vantage point of a wireless terminal e.g., user equipment (UE), the RRC states may be briefly characterized as follows:

RRC_IDLE:

- A UE specific DRX (discontinuous reception) may be configured by upper layers;
- UE controlled mobility based on network configuration;
- The UE:
  - Monitors a Paging channel;
  - Performs neighboring cell measurements and cell (re-)selection;
  - Acquires system information.

RRC_INACTIVE:

- A UE specific DRX may be configured by upper layers or by RRC layer;
- UE controlled mobility based on network configuration;
- The UE stores the Access Stratum (AS) context;
- The UE:
  - Monitors a Paging channel;
  - Performs neighboring cell measurements and cell (re-)selection;
  - Performs RAN-based notification area updates when moving outside the RAN-based notification area;
  - Acquires system information.

RRC_CONNECTED:

- The UE stores the AS context.
- Transfer of unicast data to/from UE.
- At lower layers, the UE may be configured with a UE specific DRX;
- Network controlled mobility, i.e. handover within NR and to/from E-UTRAN.;
- The UE:
  - Monitors a Paging channel;
  - Monitors control channels associated with the shared data channel to determine if data is scheduled for it;
  - Provides channel quality and feedback information;
  - Performs neighboring cell measurements and measurement reporting;
  - Acquires system information.

[00046] The technology disclosed herein concerns, e.g., apparatus, methods, and procedures for obtaining and/or updating SIBs in/of Other SI (Other SI SIBs), and also includes making a determination of SI message acquisition process failure and remedial processes therefor.

[00047] Fig. 2 shows an example communications system 20 wherein radio access node 22 communicates over air or radio interface 24 (e.g., Uu interface) with wireless terminal 26. As mentioned above, the radio access node 22 may be any suitable node for communicating with the wireless terminal 26, such as a base station node, or eNodeB ("eNB") or gNB, for

example. The node 22 comprises node processor circuitry ("node processor 30") and node transceiver circuitry 32. The node transceiver circuitry 32 typically comprises node transmitter circuitry 34 and node receiver circuitry 36, which are also called node transmitter and node receiver, respectively.

[00048] The wireless terminal 26 comprises terminal processor 40 and terminal transceiver circuitry 42. The terminal transceiver circuitry 42 typically comprises terminal transmitter circuitry 44 and terminal receiver circuitry 46, which are also called terminal transmitter 44 and terminal receiver 46, respectively. The wireless terminal 26 also typically comprises user interface 48. The terminal user interface 48 may serve for both user input and output operations, and may comprise (for example) a screen such as a touch screen that can both display information to the user and receive information entered by the user. The user interface 48 may also include other types of devices, such as a speaker, a microphone, or a haptic feedback device, for example.

[00049] For both the radio access node 22 and radio interface 24, the respective transceiver circuitries 22 include antenna(s). The transmitter circuit 34 and transmitter circuit 44 may comprise, e.g., amplifier(s), modulation circuitry and other conventional transmission equipment. The receiver circuit 36 and receiver circuit 46 may comprise, e.g., e.g., amplifiers, demodulation circuitry, and other conventional receiver equipment.

[00050] In general operation, access node, 22 and wireless terminal 26 communicate with each other across radio interface 24 using predefined configurations of information. By way of non-limiting example, the radio access node 22 and wireless terminal 26 may communicate over radio interface 24 using "frames" of information that may be configured to include various channels. In Long Term Evolution (LTE), for example, a frame, which may have both downlink portion(s) and uplink portion(s), may comprise plural subframes, with each LTE subframe in turn being divided into two slots. The frame may be conceptualized as a resource grid (a two dimensional grid) comprised of resource elements (RE). Each column of the two dimensional grid represents a symbol (e.g., an OFDM symbol on downlink (DL) from node to wireless terminal; an SC-FDMA symbol in an uplink (UL) frame from wireless terminal to node). Each row of the grid represents a subcarrier. The frame and subframe structure serves

only as an example of a technique of formatting of information that is to be transmitted over a radio or air interface. It should be understood that "frame" and "subframe" may be utilized interchangeably or may include or be realized by other units of information formatting, and as such may bear other terminology (such as blocks, for example).

[00051] To cater to the transmission of information between radio access node 22 and wireless terminal 26 over radio interface 24, the node processor 30 and terminal processor 40 of Fig. 2 are shown as comprising respective information handlers. For an example implementation in which the information is communicated via frames, the information handler for radio access node 22 is shown as node frame/signal scheduler/handler 50, while the information handler for wireless terminal 26 is shown as terminal frame/signal handler 52.

[00052] The node processor 30 of radio access node 22 also includes system information (SI) generator 54. As described above, at least some of the system information generated and provided by the system information (SI) generator 54 is Minimum System Information (Minimum SI), also known as first type system information, represented by Minimum SI handler 54M. Some of the system information may be Other system information (Other SI), also known as second type system information, represented by Other SI handler 54O in Fig. 2. The wireless terminal 26 uses the system information (SI) generated by radio access node 22. Some of the Minimum SI may inform the wireless terminal 26 of the availability of the Other IS.

[00053] Fig. 2 illustrates a generic message 2-1 by which the node radio resource controller 54 may supply the Minimal SI to wireless terminal 26. In some example implementations, upon knowing of the availability of the Other SI, due to the message 2-1, for example, the wireless terminal 26 specifically requests the Other system information, in on-demand fashion, as described herein. The terminal processor 40 of wireless terminal 26 comprises, e.g., SI processor 56, to facilitate obtaining and use of system information.

[00054] The technology disclosed herein concerns, e.g., apparatus, methods, and procedures for obtaining and/or updating system information blocks (SIBs) in/of the Other SI (Other SI SIBs) in on-demand basis. Since in at least some of the example embodiments and

modes the technology disclosed herein involves the Radio Resource Control (RRC) procedures, Fig. 2 shows terminal processor 40 as comprising node radio resource control (RRC) controller 60, e.g., node RRC controller 60. The node RRC controller 60 may execute an instance of the RRC state machine for each wireless terminal in which the access node 20 is in communication, with each instance keeping track of the RRC state transitions experienced by the wireless terminal associated with the respective instance.

[00055] Fig. 2 also shows the terminal processor 40 of wireless terminal 26 as comprising, in addition to terminal SI processor 56, a terminal RRC controller 70. The terminal RRC controller 70 includes or executes the RRC state machine discussed above, which transitions through the RRC states, as described above and shown in Fig. 2, for a communication involving wireless terminal 26.

[00056] Fig. 2 thus shows that the access node 22 comprises node processor 30, e.g., node processor circuitry 30, transmitter circuit 34, and, receiver circuit 36. The transmitter circuit 34 is configured to transmit the first type system information over a radio interface, the first type system information including availability of a SI message belonging to the second type system information. The receiver circuit 36 is configured to receive from the wireless terminal a request message to request delivery of the SI message which is available by on-demand basis. The transmitter circuit 34 is further configured to transmit the SI message to the wireless terminal.

[00057] Fig. 2 thus shows that the wireless terminal 26 communicates over radio interface 24 with access nodes, such as access node 22, of a radio access network (RAN). The wireless terminal 26 comprises receiver circuit 46, transmitter circuit 44, and terminal processor 40, e.g., terminal processor circuitry. The receiver circuit 46 is configured to receive first type system information over the radio interface. The terminal processor circuitry is configured to generate a request message to request the second type SIB which is available in an on-demand basis. The transmitter circuit 44 is configured to transmit the request message over the radio interface while in the connected state. The receiver circuit 46 is also configured to receive the SI message while in the connected state.

[00058] Fig. 3 shows example, representative acts or steps performed in conjunction with a generic method of operating a wireless terminal of a radio access network (RAN), such as wireless terminal 26 of Fig. 2. Act 3-1 comprises the wireless terminal acquiring, e.g., receiving, the Minimum SI that is broadcasted from the currently serving access node, e.g., access node 22. The Minimum SI may be broadcast in a message such as message 2-1 of Fig. 2. The Minimum SI may contain information about the Other SI, including the delivery method, e.g., periodic broadcast/on-demand, scheduling information, validity information, etc. Based on the information, the wireless terminal in act 3-2 may determine which SI message(s) to acquire by on-demand. As act 3-3, the wireless terminal may send a request message (depicted as message 2-2 of Fig. 2) to the access node, the request message indicating the SI message(s) that the wireless terminal desires to obtain. As act 3-4 the wireless terminal 26 may attempt to receive the requested SI message(s) which, e.g., was sent using message 2-3 of Fig. 2.

[00059] It was mentioned above that the first type system information includes availability of a SI message belonging to the second type system information, that the request message requests delivery of a SI message which is available by on-demand basis, and that the SI message is transmitted to the wireless terminal. It should be understood that reference herein to "a SI message belonging to the second type system information" means one or more pieces of Other system information (Other SI), e.g., one or more SI messages belonging to the second type system information. In some example situations indeed only one SI message may be advertised as available and accordingly periodically broadcasted or requested on-demand. But in other example situations plural SI messages (e.g., plural pieces of Other SI) are advertised as available, some of which may be periodically broadcasted and the others may be requested on-demand. Furthermore, it should be noted that in some configurations (e.g. the configuration presented in Fig. 7, or in Fig. 13A-D) the availability may be included in the scheduling information (e.g. *schedulingInfoList* described below).

[00060] In some configurations, the availability and delivery method information for Other SI SIBs may be included in SIB Type 1, one of the SIBs in the Minimum SI. Fig. 4 shows an example format of SIB Type 1, including *schedulingInfoList*, *si-WindowLength*, *otherSIBInfoList*, validity area identification (*si-AreaID)*, and possibly other configuration

parameters. The *otherSIBInfoList* is a list of *otherSIBInfo*, which comprises *SIB-Type,* an identifier of a SIB, *validityInfo* and validity information of the SIB (a value tag [*valueTag*], and other parameters, such as validity timer, etc.).

[00061] SIBs other than SIB1 are carried in *SystemInformation* (SI) messages and mapping of SIBs to SI messages is flexibly configurable by *schedulingInfoList* included in SIB1, with restrictions that: each SIB is contained only in a single SI message, only SIBs having the same scheduling requirement (periodicity given by *si-periodicity*) can be mapped to the same SI message. There may be multiple SI messages transmitted with the same periodicity.

[00062] In one configuration, each element, *schedulingInfo,* of *schedulingInfoList* may represent one SI message, comprising its periodicity (*si-Periodicity*), delivery method (*deliveryMethod)* indicating if this SIB is periodically broadcasted or to be transmitted upon request (on-demand), and associated SIB types (one or more *SIB-Type's*). The actual broadcast opportunity, e.g., timing/resources, of a given SI message may be determined by a pre-determined or a network-configured formula as a function of at least the corresponding periodicity. At each opportunity the broadcast of the SI message may occur within the duration of the window length (*si-WindowLength*). Hereafter a broadcast opportunity is also referred as a SI window. More than one SIB may be possibly transmitted on a same SI window.

[00063] In the configuration of Fig. 4 *si-AreaID* is common for all SI messages or SIB types, which means that all SIBs have the same validity area. Alternatively, in another configuration, each SI message may have a designated validity area. Fig. 5 shows an example format of SIB1 for such a configuration wherein each SI message may have a designated validity area. Furthermore, in another configuration, having an example format such as shown in Fig. 6, each SIB type may have a designated validity area. Thus, in differing implementations, the system information (SI) generator 54 of Fig. 2, working with node frame/signal scheduler/handler 50, generates the differing formatted SI messages of Fig. 4, Fig. 5, and Fig. 6, for transmission by node transmitter circuitry 34 over radio interface 24.

[00064] Fig. 7 is an alternative format for SIB1, which is logically equivalent to the format shown in Fig. 4. The *si-BroadcastStatus* information element of Fig. 7 may be functionally identical to *deliveryMode* information element described earlier. In one configuration, the information element *sibValueTagList* may comprise a list of value tags for the available SIBs included in *schedulingInfoList*, in the order of the SIB numbering scheme (e.g. SIB2, SIB3, SIB4, SIB5, ….). In another configuration, *sibValueTagList* may comprise a list of value tags for the available SIBs (included in *schedulingInfoList*) as well as the non-available SIBs (not included in *schedulingInfoList*), in the order of the SIB numbering scheme (e.g. SIB2, SIB3, SIB4, SIB5, ….). In this case, a pre-determined value may be set to the value tag for a non-available SIB. Accordingly, the *si-BroadcastStatus* information element may be used for indicating broadcast status (e.g. the broadcast status being either periodic broadcast or on-demand basis).

[00065] Fig. 8 is an exemplary message flow diagram of on-demand based SI acquisition procedure. As shown by act 8-0, wireless terminal 26 in either RRC_IDLE, RRC_INACTIVE or RRC_CONNECTED state stores the content of SIB#A with the validity information, *valueTag=a*, *si-AreaID=2,* which the wireless terminal has previously received. From the currently serving access node, as act 8-1 the wireless terminal may obtain SIB1 as Minimum SI. As shown in Fig. 4, Fig. 5, Fig. 6, and Fig. 7, the SIB1 includes the *scheduleInfoList*, which in turn may include one or more *schedulingInfo* information elements. An example *scheduleInfoList* for this scenario is shown in Table 1, wherein the k'th *schedulingInfo* indicates that the SI message associated with this *schedulingInfo* (SI#k, hereafter), containing SIB#A, will be available by on-demand delivery. Furthermore, the *otherSIBInfo* corresponding to SIB#A indicates that the validity information of SIB#A is *valueTag=b, si-AreaID=3.* It is assumed hereafter that whenever the wireless terminal receives SIB1, it has already received MIB beforehand.

[00066] Table 1

…

```
schedulingInfoList {
        ...
        k'th schdulingInfo (SI#k)  {
                ...
                deliveryMethod = on-demand
                SIB-type = A
                ...
        }
        ...
        }
}
...
otherSIBInfoList {
        ...
        otherISBInfo  {
                SIB-type = A
                ValidityInfo  {
                        valueTag = b
                        ...
                }
                ...
        }
        ...
}
...
si-AreaID = 3
...
```

[00067] Knowing that the stored SIB#A is now invalid, the wireless terminal may decide to obtain a valid version of SIB#A, and may initiate the SI request procedure represented by act 8-2 and explained herein. After the SI request procedure has a successful result, the wireless terminal may start the SI reception procedure, shown generally as act 8-3 in Fig. 8. In the SI reception procedure the wireless terminal monitors signals from the access node in the designated SI windows derived from the scheduling information (*scheduleInfo*) in the SIB1, and thereby attempts to receive the requested SI#k. The SI windows are shown by dotted rectangles in Fig. 8. Fig. 8 shows by act 8-3a a first transmission of the requested SI#k, which is unsuccessful, and by act 8-3b a second transmission of the requested SI#k, which is successful. A tail of a vertical down-pointing arrow in the SI reception procedure depiction of Fig. 8 is associated with start of the SI reception procedure, while the head of the same vertical

down-pointing arrow is associated with end of the SI reception procedure (at successful reception of the SI#k). Fig. 8 also shows by act 8-4 that other transmissions of the requested system information may also be made even after the wireless terminal has successfully received the sought SI#k.

[00068] In one configuration, the wireless terminal may use a counter, which is incremented at every SI window of a particular SI message, e.g. SI#k. In this configuration, the SI reception procedure may end when the requested SI message(s) are successfully received, or when the counter reaches a maximum counter value. In another configuration the wireless terminal starts a timer at the beginning of the SI reception procedure. In this configuration, the SI reception procedure may end when the requested SI message(s) are successfully received, or when the timer expires. The maximum counter value, or the timer value, which may be common for all SI messages or per-SI message basis, may be pre-configured or configured by network via system information. The conditions for the wireless terminal to end the SI reception process is referred as "termination conditions" herein.

[00069] Fig. 9A, Fig. 9B and Fig. 9C show three options for the SI request procedure. In Fig. 9A, which may be applicable to wireless terminals in any of the RRC states, the request of on-demand delivery for SI messages may be accomplished by sending a Random Access Preamble, which may comprise a sequence selected from a set of available sequences configured by the access node via Minimum SI. A given sequence is identified by a Preamble Index. When the access node detects the transmission of a preamble sequence, it may respond to it with Random Access Response, which includes the Preamble Index corresponding to the sequence. Upon receiving, the wireless terminal may validate that the Preamble index in the Random Access Response matches the one associated with the preamble sequence, and then send to the access node *SystemInformationRequest* message that includes the identity of the SI messages (e.g. SI#k) that the wireless terminal desires to receive. In response, the access node may send a *SystemInformation* message acknowledging the request, indicating that the requested SI message(s) will be broadcasted from the next SI window scheduled for the requested SI message(s).

[00070] In one configuration, the access node may include in Minimum SI a set of Preamble indices, each of which is designated for requesting on-demand delivery of one or more specific SI messages. Fig. 9B illustrates an example SI request procedure using this configuration, where the wireless terminal in any RRC state may transmit Random Access Preamble sequence given by the Preamble Index associated with the SI message(s) that the wireless terminal has selected. When the wireless terminal receives Random Access Response including the Preamble Index, it may consider that the request procedure is successful.

[00071] The SI request procedure in Fig. 9C may be applicable to wireless terminals in RRC_CONNECTED, wherein the *SystemInformationRequest* message is sent without the random access preamble/response.

[00072] In any of the three options disclosed above, the wireless terminal may proceed to the SI reception procedure if the SI request procedure is successful. Otherwise, the wireless terminal may think that the serving cell (controlled by the access node) is barred, which will invoke a cell reselection.

[00073] The *SystemInformationRequest* message shown in Fig. 9A or Fig. 9C may include an information element (e.g. *siRequest*) to indicate which SI message(s) that the wireless terminal desires to receive. In one configuration, as shown in Fig. 10**,** the *siRequest* may comprise a bit map, wherein each bit corresponds to a *schedulingInfo* information element in SIB1 of the current serving cell, the bits arranged in the order of *schedulingInfo* information elements. By doing so, each bit of the bit map may correspond to a specific SI message. Alternatively, *siRequest* may carry a field indicating that the wireless terminal desires to receive at least one on-demand basis SI message. In this case, the access node may start broadcasting all of the on-demand basis SI messages for a pre-configured duration. The *SystemInformation* message shown in Fig. 9A or Fig. 9C may include *siAck*, an information element for acknowledging *siRequest*. In one configuration, *siAck* may comprises the same bit map as the one in *SystemInformationRequest*, indicating the SI message(s) to be broadcasted. Alternatively, *siAck* may comprise one Boolean field, indicating whether the request has been accepted or not.

[00074] Fig. 11 is an exemplary message flow diagram of SI acquisition procedure for a SI message broadcasted periodically. Act 11-0 comprises the wireless terminal 26, in either RRC_IDLE, RRC_INACTIVE or RRC_CONNECTED state, storing the content of SIB#A with the validity information, e.g., *valueTag*= a and *si-AreaID*=2. Act 11-1 comprises the wireless terminal 26 obtaining, from the currently serving access node 22, SIB1 as Minimum SI, which, as understood from previous description, includes one or more *schedulingInfo* information elements. In the scenario of Fig. 11, and as shown by Table 2, the k'th *schedulingInfo* information element indicates that the SI message associated with this *schedulingInfo* (SI#k, hereafter), containing SIB#A, is currently broadcasted periodically. Furthermore, the SIB1 specifies (see Table 2) that *otherSIBInfo* corresponding to SIB#A indicates that the validity information of SIB#A is now *valueTag*=b and *si-AreaID*=3.

[00075] Knowing that the stored SIB#A is now invalid, as act 11-3 the wireless terminal 26 begins an SI reception procedure wherein the wireless terminal may attempt to acquire the SI message (SI#k) in the SI windows specified in SIB1. In Fig. 11, act 11-3a illustrates an unsuccessful SI message reception attempt in a first SI window for SI#k, followed by act 11-3b which is a successful SI message reception in a second SI window for SI#k, Thus, as shown in Fig. 11, if the SI message is not received by the end of the SI window (as was the case for act 11-3a), the wireless terminal 26 may repeat reception at the next SI window occasion for the concerned SI message until it successfully receives the SI message (as was done in act 11-3b).

[00076] Table 2

```
…
schedulingInfoList {
        …
        k'th schdulingInfo (SI#k)  {
                …
                deliveryMethod = broadcast
                SIB-type = A
                …
        }
```

```
        ...
        }
}
...
otherSIBInfoList {
        ...
        otherISBInfo  {
                SIB-type = A
                ValidityInfo  {
                        valueTag = b
                        ...
                }
                ...
        }
        ...
}
...
si-AreaID = 3
...
```

[00077] UNSUCCESSFUL ATTEMPTED RECEPTION OF ON-DEMAND SYSTEM INFORMATION

[00078] Fig. 12 shows an example communications system 20(12) comprising wireless terminal 26(12) configured to detect failure of a SI reception process involving an on-demand SI message, following a successful completion of an SI request. The access node 22(12) and wireless terminal 26(12) of Fig. 12 are essentially identical to the respective access node 22 and wireless terminal 26 of Fig. 2, except as otherwise indicated herein. In terms of likeness, for example, the radio access node 22(12) comprises node processor 30 and node transceiver circuitry 32, with the node processor 30 comprising, e.g., node frame/signal scheduler/handler 50, system information (SI) generator 54, and node RRC controller 60. Similarly, the wireless terminal 26(12) comprises terminal processor 40, terminal transceiver circuitry 42, with terminal processor 40 comprising terminal frame/signal scheduler/handler 52, system information (SI) processor 56, and terminal RRC controller 70.

[00079] Fig. 12 also shows that wireless terminal 26(12) comprises system information acquisition failure detector 80. The terminal processor 40, and particularly SI processor 56,

may comprise or constitute the system information acquisition failure detector 80. The system information acquisition failure detector 80 is configured to make a determination of a failure of the SI message acquisition process. The system information acquisition failure detector 80 may make such failure determination based on a termination condition, as herein explained.

[00080] The system information generator 54 of radio access node 22(12) is configured to generate first type system information. For the example embodiment and mode of Fig. 12, and in an example, non-limiting manner shown in Fig. 13, the first type system information comprises (information elements or the like which indicate): availability of second type SI messages; scheduling information of each of the SI messages; a delivery mode for each of the second type SI messages; and, a configuration parameter to configure at least one termination condition for determination of a failure of an SI message acquisition process for the on-demand based second type SI messages.

[00081] As understood herein, a second type SI message comprises at least one system information block (SIB), and the delivery mode may be either periodic broadcast or on-demand basis. The transmitter circuitry 36 of radio access node 22(12) is configured to transmit the first type system information over the radio interface 24 to the wireless terminal 26(12), as shown by arrow 12-1 in Fig. 12

[00082] As in the example embodiment and mode of Fig. 2, the on-demand Other SI request generator 72 of wireless terminal 26(12) may request at least one second type SI using a request message as indicated by arrow 12-2 in Fig. 12. The second type SI request message depicted by arrow 12-2 is received by node receiver circuitry 36. The node processor 30, and particularly the SI generator 54, generates the requested (second type) SI message in one or more windows of transmission, the transmission of the requested SI message being depicted by arrow 12-3 in Fig. 12.

[00083] As mentioned above, system information acquisition failure detector 80 may make a determination of a failure of the SI message acquisition process. When so doing, in an example embodiment and mode, the terminal processor 40, working in response to or with system information acquisition failure detector 80, is configured to initiate acquisition of the

first type system information. That is, the terminal processor 40 is configured, upon a failure of the SI message acquisition process, to initiate acquisition of the first type system information, e.g., to again request the first type system information (Minimum SI) from the radio access node 22(12). In Fig. 12 such request for first type system information is depicted by arrow 12-4.

[00084] Fig. 13A is an exemplary format of SIB1, which is based on the format shown in Fig. 7 with an additional information element *si-MaxAcqAttempts*. The information element *si-MaxAcqAttempts* provides a termination condition for the SI reception procedure, indicating the maximum number of SI message reception opportunities (e.g. SI windows) allowed before the end of the SI reception procedure. Fig. 13B is an alternative format of SIB1, wherein the information element *ue-TimersAndConstants* includes a timer configuration (T#x) to be used as a termination condition for the SI reception procedure.

[00085] Fig. 14 is an exemplary message flow diagram of on-demand based SI acquisition procedure wherein system information acquisition failure is detected. As shown by act 14-0, wireless terminal 26, in either RRC_IDLE, RRC_INACTIVE or RRC_CONNECTED state stores the content of SIB#A with the validity information, *valueTag=a*, *si-AreaID=2,* which the wireless terminal has previously received. From the currently serving access node, as act 14-1 the wireless terminal may obtain SIB1 as Minimum SI, e.g., first type system information. Obtaining of the SIBI is depicted by arrow 12-1 in Fig. 12. As shown in Fig. 13, the SIB1 includes the *scheduleInfoList*, which in turn may include one or more *schedulingInfo* information elements. An example *scheduleInfoList* for this scenario is shown in previously-discussed Table 1, wherein the k'th *schedulingInfo* indicates that the SI message associated with this *schedulingInfo* (SI#k, hereafter), containing SIB#A, will be available by on-demand delivery. Furthermore, the *otherSIBInfo* corresponding to SIB#A indicates that the validity information of SIB#A is *valueTag=b, si-AreaID=3*. It is assumed hereafter that whenever the wireless terminal receives SIB1, it has already received MIB beforehand.

[00086] Knowing that the stored SIB#A is now invalid, the wireless terminal may decide to obtain a valid version of SIB#A, and may initiate the SI request procedure represented by act 14-2 and explained herein and illustrated by arrow 12-2 in Fig. 12. After the SI request

procedure has a successful result, the wireless terminal may start the SI reception procedure, shown generally as act 14-3 in Fig. 14. In the SI reception procedure the wireless terminal monitors signals from the access node (depicted by arrow 12-3 in Fig 12) in the designated SI windows derived from the scheduling information (*scheduleInfo*) in the SIB1, and thereby attempts to receive the requested SI#k. The SI windows are shown by dotted rectangles in Fig. 14. Fig. 14 shows by act 14-3a, act 14-3b, and act 14-3c three successive transmissions of the requested SI#k, all of which are unsuccessful. A tail of a vertical down-pointing arrow in the SI reception procedure depiction of Fig. 14 is associated with start of the SI reception procedure, while the head of the same vertical down-pointing arrow is associated with end of the SI reception procedure. In Fig. 14, the SI reception procedure fails. Failure of the SI reception procedure is determined by system information acquisition failure detector 80 which, as indicated above, makes a determination of a failure of the SI message acquisition process based on a termination condition. Examples of the termination condition are described below.

[00087] Upon detection of failure of the SI message acquisition process, as act 14-4 the terminal processor 40 initiates (re)acquisition of the first type system information, e.g., the MINIMAL SI or SIB1, as shown by arrow 12-4 in Fig. 12. The wireless terminal 26(12) thus attempts to again acquire the first type system information, in hopes that the SI message acquisition process can thereafter be repeated and perhaps in such repeat of the SI message acquisition process the requested SI message will be obtained. In an example implementation, the wireless terminal 26(12) may optionally reacquire MIB prior to reacquisition of SIB1. Accordingly, not having a valid version of a stored SIB, upon detection of failure of the SI message acquisition process, the terminal processor 40 initiates (re)acquisition of the first type system information.

[00088] Fig. 15 shows basic, representative, example acts or steps performed by the wireless terminal 26(12) of Fig. 12. Act 15-1 comprises receiving the first type system information (SI) from the base station apparatus. As mentioned above, the first type system information comprises: availability of a second type SI message, the second type SI message comprising at least one system information block (SIB); scheduling information for the SI message; an indication of a delivery mode for the second type SI message, the delivery mode being either periodic broadcast or on-demand basis; and, at least one termination condition for

determination of a failure of an SI message acquisition process for the on-demand based second type SI message. Act 15 -2 comprises transmitting an SI request message to request at least one second type SI message indicated as on-demand delivery. Act 15-3 comprises initiating the SI message acquisition process. Act 15-4 comprises determining a failure of the SI message acquisition process. Act 15-5 comprises, upon a failure of the SI message acquisition process, initiating acquisition of the first type system information.

[00089] Fig. 16 is a flowchart showing basic, representative, example acts or steps performed by the access node 22(12) of Fig. 12. Act 16-1 comprises transmitting first type system information (SI). The first type SI has been described above. Act 16-2 comprises receiving an SI request message to request at least one second type SI message. Act 16-3 comprises delivering the requested SI message. As understood from above, the requested SI message may be sent periodically, repeatedly transmitted at a predetermined interval, for a predetermined length of time.

[00090] It was mentioned above that, in one configuration, the wireless terminal may use a counter, which is incremented at every SI window of a particular SI message, e.g. SI#k, and that the SI reception procedure may end when the requested SI message(s) are successfully received, or when the counter reaches a maximum counter value. In some configurations, the maximum counter value may be configured by SIB1 (e.g. *si-MaxAcqAttempts* shown in Fig. 13A). Fig. 17A shows the system information acquisition failure detector 80 as comprising such counter as SI window counter 82. Thus in one example implementation of the Fig. 12 example embodiment and mode, the termination condition may comprise SI window counter 82 counting up to reach a maximum value, or counting down from a pre-set value to zero. Such maximum or pre-set value may be configured by the radio access node 22(12). The SI window counter 82 is incremented (or decremented) in a case in which the requested SI message was not received by the end of one reception opportunity, e.g., a case in which the requested SI message was not received by the end of an SI window.

[00091] It was further mentioned above that, in another configuration the wireless terminal may start a timer at the beginning of the SI reception procedure, and that the SI reception procedure may end when the requested SI message(s) are successfully received, or

when the timer expires. In some configuration, the timer is configured by SIB1 (e.g. the timer configuration T#x in Fig. 13B). Fig. 17B shows the system information acquisition failure detector 80 as comprising such a timer: SI message acquisition process timer 84. Thus in another example implementation of the Fig. 12 example embodiment and mode, the termination condition may comprise SI message acquisition process timer 84 expiration of a timer configured by the base station apparatus. The SI message acquisition process timer 84 is started at the beginning of the SI message acquisition process. The timer expiration value may be configured by the radio access node 22(12).

[00092] As understood from above, the Other SI may comprise one or more (Other) SI messages, also known as second type SI messages. In one example implementation, as reflected by Fig. 18A, the termination condition may be common for plural, e.g., all, SI messages. That is, in the Fig. 18A implementation, the maximum counter value in the case of Fig. 17A, or the timer value in the case of Fig. 17B, may be common for all SI messages. In this case, the counter value configuration or the timer configuration in Minimum SI (e.g. *si-MaxAcqAttempts* in Fig. 13A, or T#x in Fig. 13B) may comprise a single parameter. Alternatively, as shown in the example implementation of Fig. 18B, the termination condition may be configured on a per-SI message basis, e.g., uniquely configured for one or more (Other SI) SI messages. In this case, the counter value configuration or the timer configuration in Minimum SI (e.g. *si-MaxAcqAttempts* in Fig. 13A, or T#x in Fig. 13B) may comprise a list of parameters, each of which configures a corresponding SI message. In either the Fig. 18A or Fig. 18B implementations, the termination condition(s), whether common or not common, e.g., unique, may be pre-configured or configured by network via system information. Thus, the condition for the wireless terminal to end the SI reception process is referred as a "termination condition" herein.

[00093] The foregoing is now discussed in context of a more general 3GPP TS SI acquisition procedure for a UE to acquire the AS- and NAS information. This more 3GPP TS procedure applies to UEs in RRC_IDLE, in RRC_INACTIVE and in RRC_CONNECTED. The UE in RRC_IDLE and RRC_INACTIVE shall ensure having a valid version of (at least) the *MIB*, *SIB1* as well as *SIB X* through *SIB Y* (depending on support of the concerned RATs for UE controlled mobility). The UE in RRC_CONNECTED shall ensure having a valid

version of (at least) the *MIB*, *SIB1* as well as *SIB X* (depending on support of mobility towards the concerned RATs).

[00094] For the acquisition of MIB and SIB1, the UE shall perform the acts below (wherein reference to any "section", "clause", or "sub-clause" is to the respective section, clause, or sub-clause of 3GPP TS 38.331.)

1> if the cell is a PSCell:

2> acquire the *MIB*;

2> perform the actions specified in section 5.2.2.4.1;

1> else:

2> acquire the *MIB*;

2> if the UE is unable to acquire the *MIB*;

3> perform the actions as specified in clause 5.2.2.5;

2> else:

3> perform the actions specified in section 5.2.2.4.1.

2> acquire the *SIB1*,

2> if the UE is unable to acquire the *SIB1*:

3> perform the actions as specified in clause 5.2.2.5;

2> else:

3>perform the actions specified in section 5.2.2.4.2.

[00095] From the foregoing it is understood that the UE shall apply the SI acquisition procedure as defined above upon cell selection (e.g. upon power on), cell-reselection, return from out of coverage, after reconfiguration with sync completion, after entering NR-RAN from another RAT, upon receiving an indication that the system information has changed, upon receiving a PWS notification, upon failing to acquire an SI message; whenever the UE does not have a valid version in the stored SI.

[00096] From the foregoing it is understood that, in an example implementation, when acquiring an SI message, the UE may perform the following acts:

1> determine the start of the SI-window for the concerned SI message.

1> if SI message acquisition is not triggered due to UE request:

2> receive DL-SCH using the SI-RNTI from the start of the SI-window and continue until the end of the SI-window whose absolute length in time is given by *si-WindowLength*, or until the SI message was received;

2> if the SI message was not received by the end of the SI-window, repeat reception at the next SI-window occasion for the concerned SI message;

1> else if SI message acquisition is triggered due to UE request:

2> Set the SI window counter 82 to 0 (or Start SI message acquisition process timer 84);

2> [FFS receive DL-SCH using the SI-RNTI from the start of the SI-window and continue until the end of the SI-window whose absolute length in time is given by si-WindowLength, or until the SI message was received];

2>[FFS if the SI message was not received by the end of the SI-window, increment the SI window counter 82 , repeat reception at the next SI-window occasion for the concerned SI message];

2>if the SI window counter 82 is equal to configured maximum value or counted down to zero (or timer SI message acquisition process timer 84 expires)

3> Initiate the SI acquisition procedure.

[00097] When the UE acquires a *MIB* or a *SIB1* or a SI message in a currently camped/serving cell as described in clause 5.2.2.3, the UE shall store the acquired SI. A version of the SI that the UE stored is out of date after 3 hours. The UE may use such a stored version of the SI e.g. after cell re-selection, upon return from out of coverage or after the reception of SI change indication. The storage and management of the stored SI in addition

to the SI relevant for the current camped/serving cell is left to UE implementation. The UE shall:

1> delete any stored version of a SIB after 3 hours from the moment it was successfully confirmed as valid;

1> if UE has stored version of any SIB:

2>for each SIB:

3> if the stored SIB is area specific SIB and if *systemInfoAreaIdentifier* and *systemInfoValueTag* included in the *SIB1* received from the currently camped/serving cell are identical to the *systemInfoAreaIdentifier* and *systemInfoValueTag* associated with stored version of that SIB; or

3> if the stored SIB is cell specific and if *systemInfoValueTag* included in the *SIB1* received from the currently camped/serving cell is identical to the *systemInfoValueTag* associated with stored version of that SIB;

4> consider the stored SIB as valid for the cell;

3> else:

4> (re)acquire the corresponding SI message as specified in clause 5.2.2.3.

1> if UE has no stored version of a SIB:

2> (re)acquire the corresponding SI message as specified in clause 5.2.2.3.

[00098] UNSUCCESSFUL ATTEMPTED RECEPTION OF BROADCASTED SYSTEM INFORMATION

[00099] The previous embodiments disclose, e.g., procedure(s) for acquiring an SI message currently broadcasted periodically, wherein the wireless terminal may continue the SI reception procedure until successful completion. This operation may be valid if the concerned

SI message is assumed to be broadcasted forever. By the introduction of on-demand SI, however, the assumption is not guaranteed to be true. For instance, when the wireless terminal sees *deliveryMode*=broadcast in SIB1 for the SI message of concern, it is possible that the access node may be temporarily broadcasting the SI message in response to a request from another wireless terminal, and that the access node may stop the periodic broadcast eventually.

[000100] Whereas the example communications system 20(12) of Fig. 12 primarily concerns unsuccessful attempted reception of on-demand system information, Fig. 19 shows an example communications system 20(17) comprising wireless terminal 26(17) configured to detect failure of a SI reception process involving a periodically broadcast SI message. The access node 22(17) and wireless terminal 26(17) of Fig. 19 are essentially identical to the respective access node 22 and wireless terminal 26 of Fig. 2 and Fig. 12, except as otherwise indicated herein. In terms of likeness, for example, the radio access node 22(17) comprises node processor 30 and node transceiver circuitry 32, with the node processor 30 comprising, e.g., node frame/signal scheduler/handler 50, system information (SI) generator 54, and node RRC controller 60. Similarly, the wireless terminal 26(17) comprises terminal processor 40, terminal transceiver circuitry 42, with terminal processor 40 comprising terminal frame/signal scheduler/handler 52, system information (SI) processor 56, and terminal RRC controller 70.

[000101] Fig. 19 shows that wireless terminal 26(17) also comprises system information acquisition failure detector 80. As in the case of Fig. 12, terminal processor 40, and particularly SI processor 56, may comprise or constitute the system information acquisition failure detector 80. The system information acquisition failure detector 80 is configured to make a determination of a failure of the SI message acquisition process. The system information acquisition failure detector 80 may make such failure determination based on a termination condition, as herein explained.

[000102] As in the Fig. 12 example embodiment and mode, system information generator 54 of radio access node 22(12) is configured to generate first type system information. For the example embodiment and mode of Fig. 19, and in the example, non-limiting manner shown in Fig. 13, the first type system information comprises (information elements or the like which indicate): availability of second type SI messages; scheduling information of each of the SI

messages; a delivery mode for each of the second type SI messages; and, a configuration parameter to configure at least one termination condition for determination of a failure of an SI message acquisition process for the on-demand based second type SI messages. As understood herein, a second type SI message comprises at least one system information block (SIB), and the delivery mode may be either periodic broadcast or on-demand basis. The transmitter circuitry 36 of radio access node 22(17) is configured to transmit the first type system information over the radio interface 24 to the wireless terminal 26(17), as shown by arrow 19-1 in Fig. 19.

[000103] In the Fig. 19 example embodiment and mode it is assumed that wireless terminal 26(17) is presently concerned with acquiring a second type SI message for which the delivery mode is periodic broadcast. As such, the terminal processor 40 is controlling terminal receiver 46 to initiate a SI message acquisition process for a periodically broadcasted second type SI message. But it may turn out, however, after initiating the SI message acquisition process, that the expected periodically broadcasted second type SI message(s) are not received. Non-receipt of the periodically broadcasted second type SI message(s) may be for any of several reasons, including the fact that the broadcast of the periodically broadcasted second type SI message was at the behest of another wireless terminal, with the wireless terminal 26(17) essentially being a third-party beneficiary of the broadcasts, and the access node has by now terminated the broadcast of the second type SI message intended for the another wireless terminal.

[000104] Thus, as in the Fig. 12 example embodiment and mode, system information acquisition failure detector 80 may make a determination of a failure of the SI message acquisition process. When so doing, in an example embodiment and mode, the terminal processor 40, working in response to or with system information acquisition failure detector 80, is configured to initiate acquisition of the first type system information. That is, the terminal processor 40 is configured, upon a failure of the SI message acquisition process involving a periodically broadcasted second type SI message, to initiate acquisition of the first type system information, e.g., to again request the first type system information (Minimum SI) from the radio access node 22(17). In Fig. 19 such request for first type system information is depicted by arrow 19-4 (there being no arrow 19-2 or arrow 19-3 in Fig. 19).

[000105] Fig. 20 is an exemplary message flow diagram of a periodic broadcast based SI acquisition procedure wherein system information acquisition failure is detected. As shown by act 20-0, wireless terminal 26, in either RRC_IDLE, RRC_INACTIVE or RRC_CONNECTED state stores the content of SIB#A with the validity information, *valueTag=a*, *si-AreaID=2,* which the wireless terminal has previously received. From the currently serving access node, as act 20-1 the wireless terminal may obtain SIB1 as Minimum SI, e.g., first type system information. Obtaining of the SIBI is also depicted by arrow 19-1 in Fig. 19. As shown in Fig. 13, the SIB1 includes the *scheduleInfoList*, which in turn may include one or more *schedulingInfo* information elements. An example *scheduleInfoList* for this scenario is shown in previously-discussed Table 3, wherein the k'th *schedulingInfo* indicates that the SI message associated with this *schedulingInfo* (SI#k, hereafter), containing SIB#A, will be available by broadcast. Furthermore, the *otherSIBInfo* corresponding to SIB#A indicates that the validity information of SIB#A is *valueTag=b, si-AreaID=3*. It is assumed hereafter that whenever the wireless terminal receives SIB1, it has already received MIB beforehand.

[000106] Having received the SIB1 as Minimum SI, e.g., first type system information, the wireless terminal 26(17) knows when the radio access node 22(17) is expected to broadcast the system information for the sought second type SI, e.g., SIB#A. As such, the terminal processor 40 of wireless terminal 26(17) begins the SI reception procedure (represented by act 20-3 in Fig. 20).

[000107] In the SI reception procedure 20-3, the wireless terminal monitors signals from the access node attempts to obtain the SI messages in the designated SI windows derived from the scheduling information (*scheduleInfo*) in the SIB1, and thereby attempts to receive the requested SI#k. The SI windows are shown by dotted rectangles in Fig. 20. Fig. 20 shows by act 20-3a, act 20-3b, and act 20-3c three successive transmissions of the requested SI#k, all of which are unsuccessful. A tail of a vertical down-pointing arrow in the SI reception procedure depiction of Fig. 20 is associated with start of the SI reception procedure, while the head of the same vertical down-pointing arrow is associated with end of the SI reception procedure. In Fig. 20, the SI reception procedure 20-3 utterly fails. Failure of the SI reception procedure is determined by system information acquisition failure detector 80 which, as indicated above,

makes a determination of a failure of the SI message acquisition process based on a termination condition. Examples of the termination condition are described herein.

[000108] Upon detection of failure of the SI message acquisition process, as act 20-4 the terminal processor 40 initiates (re)acquisition of the first type system information, e.g., the MINIMAL SI or SIB1, as shown by arrow 14-4 in Fig. 14. The wireless terminal 26(14) thus attempts to again acquire the first type system information, in hopes that the SI message acquisition process can thereafter be repeated and perhaps in such repeat of the SI message acquisition process the requested SI message will be obtained. In an example implementation, the wireless terminal 26(14) may optionally reacquire MIB prior to reacquisition of SIB1. Accordingly, not having a valid version of a stored SIB, upon detection of failure of the SI message acquisition process, the terminal processor 40 initiates (re)acquisition of the first type system information.

[000109] Fig. 21 is a flowchart showing basic, representative, example acts or steps performed by the wireless terminal of Fig. 19. Act 21-1 comprises receiving first type system information (SI) from the base station apparatus. As indicated previously, the first type system information comprises: availability of a second type SI message; scheduling information for the SI message; an indication of a delivery mode for the second type SI message, the delivery mode being either periodic broadcast or on-demand basis; and, at least one termination condition for determination of a failure of an SI message acquisition process. Act 21-2 comprises initiating the SI message acquisition process for a periodically broadcasted second type SI message. Act 21-3 comprises determining a failure of the SI message acquisition process. Act 21-4 comprises, upon a failure of the SI message acquisition process, initiating acquisition of the first type system information.

[000110] Fig. 22 is a flowchart showing basic, representative, example acts or steps performed by the access node of Fig. 19. Act 22-1 comprises transmitting first type system information (SI) from the base station apparatus. The first type system information comprises, e.g., configuration parameters to configure for at least one termination condition for determination of a failure of an SI message acquisition process. Act 22-2 comprises broadcasting the periodic broadcast-based SI messages.

[000111] As in the Fig. 12 embodiment and mode, wireless terminal 26(17) may use a counter, which is incremented at every SI window of a particular SI message, e.g. SI#k, and may end the SI reception procedure when the requested SI message(s) are successfully received, or when the counter reaches a maximum counter value. The system information acquisition failure detector 80 of Fig. 19 may comprise the aforementioned SI window counter 82, shown in Fig. 17A, which may count up to reach a maximum value, or count down from a pre-set value to zero. Such maximum or pre-set value may be configured by the radio access node 22(17). The SI window counter 82 is incremented (or decremented) in a case in which the requested SI message was not received by the end of one reception opportunity, e.g., a case in which the requested SI message was not received by the end of an SI window.

[000112] Also as in the Fig. 12 embodiment and mode, wireless terminal 26(17) may start a timer at the beginning of the SI reception procedure, and may end the SI reception procedure when the requested SI message(s) are successfully received, or when the timer expires. The system information acquisition failure detector 80 of Fig. 19 may comprise the aforementioned SI message acquisition process timer 84 shown in Fig. 17B when the termination condition comprises expiration of acquisition process timer 84. The SI message acquisition process timer 84 is started at the beginning of the SI message acquisition process. The timer expiration value may be configured by the radio access node 22(17).

[000113] Thus, similar to the example embodiments and modes of Fig. 2 and Fig. 12, for acquisition of periodic broadcast-based SI message(s) as shown in Fig. 19 an extra mechanism to terminate the SI reception procedure may employed. In one configuration, the wireless terminal may use a counter, which is incremented at every SI window of a particular SI message (e.g. SI#k). In this configuration, the SI reception procedure triggered by acquiring may end when the requested SI message is successfully received, or when the counter reaches a maximum counter value. (It should be understood that this counter implementation is logically identical to an alternative implementation, wherein the counter is set with the maximum counter value at the beginning of the SI reception procedure and decremented upon the end of the SI window. In this implementation, the SI reception procedure may end when the counter becomes a pre-determined value, such as zero). In another configuration the wireless terminal starts a timer at the beginning of the SI reception procedure. In this

configuration, the SI reception procedure may end when the requested SI message is successfully received, or when the timer expires. Similar to the embodiment of Fig. 12, and as understood by Fig. 18A and Fig. 18B, the maximum counter value, or the timer value, may be common for all SIB types, per-SIB type basis or per-SI message basis, may be pre-configured or configured by network via system information.

[000114] It should further be understood that a wireless terminal may be attempting to receive some second type SI by periodic broadcast, and one or more other second type SI by on-demand delivery. Hence, in a further example embodiment and mode the terminal processor 40 of a wireless terminal, such as wireless terminal 26(17), may be configured to both detect failure of a SI message acquisition process for broadcasted second type system information and detect failure of a SI message acquisition process for on-demand second type system information. For this reason the terminal processor 40 of wireless terminal 26(17) shows terminal processor 40 and SI processor 56 in particular as still comprising on-demand Other SI request generator 72. Thus it is possible in some modes for both the process of Fig. 14 and Fig. 19 to be executing essentially currently.

[000115] When a wireless terminal 26 is capable of both detecting failure of a SI message acquisition process for broadcasted second type system information and detecting failure of a SI message acquisition process for on-demand second type system information, the wireless terminal 26 may have separate termination conditions for each process. For that reason the wireless terminal 26 may comprise plural SI window counters 82 and/or plural SI message acquisition process timers 84. For example, the wireless terminal may have a first SI window counter 82(B) for a SI message acquisition process for broadcasted second type system information; and a second SI window counter 82(D) for a SI message acquisition process for on-demand second type system information. Or, for example, wireless terminal may have a first SI message acquisition process timer 84(B) for a SI message acquisition process for broadcasted second type system information; and a second SI message acquisition process timer 84(D) for a SI message acquisition process for on-demand second type system information.

[000116] Furthermore, the counter configuration or the timer configuration for acquisition of periodic broadcast-based SI message(s) may be configured via system information (e.g. SIB1) separately from the configuration for acquisition of on-demand based SI message(s). In this case, SIB1 shown in Fig. 13C with two separate counter configurations (*si-MaxAcqAttemptsOnDemand* and *si-MaxAcqAttemptsPeriodic*) or Fig. 13D with two separate timer configurations (T#x for on-demand and T#y for periodic broadcast) may be used. Alternatively, the counter/timer configuration common for on-demand and periodic broadcast-based SI message acquisition may be configured. In this case, SIB1 shown in Fig. 13A (common counter configuration) or Fig. 13B (common timer configuration) may be used.

[000117] The aforementioned more general 3GPP TS SI acquisition procedure for a UE to acquire the AS- and NAS information may be modified in part, e.g., for acquisition of an SI Message, for the example embodiment and mode of Fig. 19 as shown below. As indicated earlier, the counters (SI window counter 82(B) and SI window counter 82(D)) or the timers (SI message acquisition process timer 84(B) and SI message acquisition process timer 84(D)) may be identical, or alternatively separately configured.

When acquiring an SI message, the UE shall:

1> determine the start of the SI-window for the concerned SI message as follows:

1> if SI message acquisition is not triggered due to UE request:

2> Set the counter SI window counter 82(B) to 0 (or Start timer SI message acquisition process timer 84(B));

2> receive DL-SCH using the SI-RNTI from the start of the SI-window and continue until the end of the SI-window whose absolute length in time is given by si-WindowLength, or until the SI message was received;

2> if the SI message was not received by the end of the SI-window, increment the counter SI window counter 82(B), repeat reception at the next SI-window occasion for the concerned SI message;

2>if the counter SI window counter 82(B) is equal to [configured maximum value] (or timer SI message acquisition process timer 84(B) expires)

3> Initiate the SI acquisition procedure as defined in sub-clause 5.2.2.3.

1> else if SI message acquisition is triggered due to UE request:

2> Set the counter SI window counter 82(D) to 0 (or Start timer SI message acquisition process timer 84(D));

2> [receive DL-SCH using the SI-RNTI from the start of the SI-window and continue until the end of the SI-window whose absolute length in time is given by si-WindowLength, or until the SI message was received];

2>[if the SI message was not received by the end of the SI-window, increment the counter SI window counter 82(D) , repeat reception at the next SI-window occasion for the concerned SI message];

2>if the counter SI window counter 82(D) is equal to [configured maximum value] (or timer SI message acquisition process timer 84(D) expires)

3> Initiate the SI acquisition procedure as defined in sub-clause 5.2.2.3.

[000118] Features from each of the example embodiments and modes described herein may be combined with one another. For example information elements described in conjunction with the example embodiment and mode of Fig. 2 may also be utilized with the other example embodiments and modes described herein, including but not limited to the example embodiment and mode of Fig. 14 and Fig. 19. Further, features of the "Example Embodiments" enumerated hereinafter may also be used in conjunction with one another.

[000119] Certain units and functionalities of node 22, node 22-12, node 22-17, wireless terminal 26, wireless terminal 26-14, and wireless terminal 26-17 are, in example embodiments, implemented by electronic machinery, computer, and/or circuitry. For example, the node processors 30 and terminal processors 40 of the example embodiments herein described and/or encompassed may be comprised by the computer circuitry of Fig. 23. Fig. 23 shows an example of such electronic machinery or circuitry, whether node or terminal, as

comprising one or more processor(s) circuits 190, program instruction memory 192; other memory 194 (e.g., RAM, cache, etc.); input/output interfaces 196; peripheral interfaces 198; support circuits 199; and busses 200 for communication between the aforementioned units.

[000120] The program instruction memory 192 may comprise coded instructions which, when executed by the processor(s), perform acts including but not limited to those described herein. Thus is understood that each of node processor 30 and terminal processor 40, for example, comprise memory in which non-transient instructions are stored for execution.

[000121] The memory 194, or computer-readable medium, may be one or more of readily available memory such as random access memory (RAM), read only memory (ROM), floppy disk, hard disk, flash memory or any other form of digital storage, local or remote, and is preferably of non-volatile nature. The support circuits 199 are coupled to the processors 190 for supporting the processor in a conventional manner. These circuits include cache, power supplies, clock circuits, input/output circuitry and subsystems, and the like.

[000122] Further, it should be understood that, when a processor or processor circuitry is mentioned in conjunction with any of the preceding example embodiments and modes, it should be understood that the device hosting the processor, whether wireless terminal or access node, may comprise at least one processor and at least one memory including computer program code, the memory and the computer program code being configured to, working with the at least one processor, to cause the host device to perform the functions afore-described.

[000123] Thus, the technology disclosed herein solves problems in the field of telecommunications, including problems in telecommunications nodes such wireless terminals and access nodes, as well as computers/processors and hardware comprising such nodes. System information is of utmost importance to the operation of telecommunication nodes, so that each node can obtain the necessary network information to coordinate and communicate with other nodes and to perform its desired functions. The system information is quite extensive and complex, and may be changeable/updateable due to network and operating conditions, for example. Efficiently obtaining and using the system information is challenging, particularly in view of numerous other telecommunications functions that may be

simultaneously on-going based on the system information. The technology disclosed herein solves problem that may occur when SI messages are not timely received by, e.g., curtailing SI reception procedures and initiating remedial measures such as re-acquiring SIB1. The technology disclosed herein thus avoids waste of time and undue expenditure of processing resources.

[000124] The technology of this application thus encompasses but is not limited to the following example embodiments, example features, and example advantages, wherein the suffix "D" refers to an on-demand example embodiment and the suffix "B" refers to a periodic broadcast example embodiment:

[000125] Example Embodiment 1D: A user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the user equipment comprising:

receiver circuitry configured to receive first type system information (SI) from the base station apparatus, the first type SI comprising:

availability of a second type SI message, the second type SI message comprising at least one system information block (SIB);

scheduling information for the SI message;

an indication of a delivery mode for the second type SI message, the delivery mode being either periodic broadcast or on-demand basis; and

at least one termination condition for determination of a failure of an SI message acquisition process;

transmitter circuitry configured to transmit an SI request message to request at least one second type SI message indicated as on-demand delivery;

processor circuitry configured:

to use the receiver circuitry to initiate the SI message acquisition process;

to make a determination of a failure of the SI message acquisition process based on the termination condition; and

upon a failure of the SI message acquisition process, to initiate acquisition of the first type system information.

[000126] Example Embodiment 2D: The user equipment of Example Embodiment 1D, wherein the termination condition comprises a counter reaching a maximum value configured by the base station apparatus, the counter incremented in a case where the requested SI message was not received by the end of one reception opportunity.

[000127] Example Embodiment 3D: The user equipment of Example Embodiment 2D, wherein the reception opportunity is an SI window configured by the base station apparatus.

[000128] Example Embodiment 4D: The user equipment of Example Embodiment 1D, wherein the termination condition comprises a counter reaching zero from a preset value configured by the base station apparatus, the counter decremented in a case where the requested SI message was not received by the end of one reception opportunity.

[000129] Example Embodiment 5D: The user equipment of Example Embodiment 4D, wherein the reception opportunity is an SI window configured by the base station apparatus.

[000130] Example Embodiment 6D: The user equipment of Example Embodiment 1D, wherein the termination condition comprises an expiration of a timer configured by the base station apparatus, the timer starting upon start of the SI message acquisition process.

[000131] Example Embodiment 7D: A method for a user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), comprising:

receiving first type system information (SI) from the base station apparatus, the first type SI comprising:

availability of a second type SI message, the second type SI message comprising at least one system information block (SIB);

scheduling information for the SI message;

an indication of a delivery mode for the second type SI message, the delivery mode being either periodic broadcast or on-demand basis;

at least one termination condition for determination of a failure of an SI message acquisition process for the on-demand based second type SI message;

transmitting an SI request message to request at least one second type SI message indicated as on-demand delivery;

initiating the SI message acquisition process;

determining a failure of the SI message acquisition process; and

upon a failure of the SI message acquisition process initiating acquisition of the first type system information.

[000132] Example Embodiment 8D: The method of Example Embodiment 7D, wherein the failure of the SI message acquisition process is determined by a counter reaching a maximum value configured by the base station apparatus, the counter incremented in a case where the requested SI message was not received by the end of one reception opportunity.

[000133] Example Embodiment 9D: The method of Example Embodiment 7D, wherein the reception opportunity is an SI window configured by the base station apparatus.

[000134] Example Embodiment 10D: The method of Example Embodiment 7D, wherein the failure of the acquisition process is determined by an expiration of a timer configured by the base station apparatus, the timer starting upon start of the SI message acquisition process.

[000135] Example Embodiment 11D: A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:

transmitter circuitry configured to transmit first type system information (SI), the first type SI comprising:

availability of a second type SI message, the second type SI message comprising at least one system information block (SIB);

scheduling information for the SI message;

an indication of a delivery mode for the second type SI message, the delivery mode being either periodic broadcast or on-demand basis;

a configuration parameter to configure at least one termination condition for determination of a failure of an SI message acquisition process for the on-demand second type SI message;

receiver circuitry configured to receive an SI request message to request at least one second type SI message;

processor circuitry configured to use the transmitter circuitry to deliver the requested SI message.

[000136] Example Embodiment 12D: The base station apparatus of Example Embodiment 11D, wherein the termination condition comprises a counter reaching a maximum value configured by the base station apparatus, the counter incremented in the case where the requested SI message was not received by the end of one reception opportunity.

[000137] Example Embodiment 13D: The base station apparatus of Example Embodiment 12D, wherein the reception opportunity is an SI window configured by the base station apparatus.

[000138] Example Embodiment 14D: The base station apparatus of Example Embodiment 11D, wherein the termination condition comprises an expiration of a timer configured by the base station apparatus, the timer starting upon start of the SI message acquisition process.

[000139] Example Embodiment 15D: A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, comprising:

transmitting first type system information (SI), the first type SI comprising:

availability of a second type SI message, the second type SI message comprising at least one system information block (SIB);

scheduling information for the SI message;

an indication of a delivery mode for the second type SI message, the delivery mode being either periodic broadcast or on-demand basis;

a configuration parameter to configure at least one termination condition for determination of a failure of an SI message acquisition process for the on-demand second type SI message;

receiving an SI request message to request at least one second type SI message;

delivering the requested SI message.

[000140] Example Embodiment 16D: The method of Example Embodiment 15D, wherein the termination condition comprises a counter reaching a maximum value configured by the base station apparatus, the counter incremented in the case where the requested SI message was not received by the end of one reception opportunity.

[000141] Example Embodiment 17D: The method of Example Embodiment 15D, wherein the reception opportunity is an SI window configured by the base station apparatus.

[000142] Example Embodiment 18D: The method of Example Embodiment 15D, wherein the termination condition comprises an expiration of a timer configured by the base station apparatus, the timer starting upon start of the SI message acquisition process.

[000143] Example Embodiment 1B: A user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the user equipment comprising:

receiver circuitry configured to receive first type system information (SI) from the base station apparatus, the first type system information comprising:

availability of a second type SI message, the second type SI message comprising at least one system information block (SIB);

scheduling information for the SI message;

an indication of a delivery mode for the second type SI message, the delivery mode being either periodic broadcast or on-demand basis; and

at least one termination condition for determination of a failure of an SI message acquisition process;

processor circuitry configured:

to use the receiver circuitry to initiate the SI message acquisition process for a periodically broadcasted second type SI message;

to make a determination of a failure of the SI message acquisition process based on the termination condition; and

upon a failure of the SI message acquisition process, to initiate acquisition of the first type system information.

[000144] Example Embodiment 2B: The user equipment of Example Embodiment 1B, wherein the termination condition comprises a counter reaching a maximum value configured by the base station apparatus, the counter incremented in the case where the requested SI message was not received by the end of one reception opportunity.

[000145] Example Embodiment 3B: The user equipment of Example Embodiment 2B, wherein the reception opportunity is an SI window configured by the base station apparatus.

[000146] Example Embodiment 4B: The user equipment of Example Embodiment 1B, wherein the termination condition comprises an expiration of a timer configured by the base station apparatus, the timer starting upon start of the SI message acquisition process.

[000147] Example Embodiment 5B: The user equipment of Example Embodiment 1B, wherein the termination condition is also used for an SI message acquisition process of on-demand basis second type SI messages.

[000148] Example Embodiment 6B: The user equipment of Example Embodiment 1B, wherein the termination condition is dedicated for SI message acquisition process of periodically broadcasted basis second type SI messages.

[000149] Example Embodiment 7B: The user equipment of Example Embodiment 6B, wherein the first type SI further comprises at least one termination condition dedicated for the SI message acquisition process of on-demand basis second type SI messages.

[000150] Example Embodiment 8B: A method for a user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), comprising:

receiving first type system information (SI) from the base station apparatus, the first type system information comprising:

availability of a second type SI message, the second type SI message comprising at least one system information block (SIB);

scheduling information for the SI message;

an indication of a delivery mode for the second type SI message, the delivery mode being either periodic broadcast or on-demand basis;

at least one termination condition for determination of a failure of an SI message acquisition process;

initiating the SI message acquisition process for a periodically broadcasted second type SI message;

determining a failure of the SI message acquisition process; and

upon a failure of the SI message acquisition process, initiating acquisition of the first type system information.

[000151] Example Embodiment 9B: The method of Example Embodiment 8B, wherein the failure of the SI message acquisition process is determined by a counter reaching a maximum value configured by the base station apparatus, the counter incremented in the case where the requested SI message was not received by the end of one reception opportunity.

[000152] Example Embodiment 10B: The method of Example Embodiment 9B, wherein the reception opportunity is an SI window configured by the base station apparatus.

[000153] Example Embodiment 11B: The method of Example Embodiment 8B, wherein the failure of the acquisition process is determined by an expiration of a timer configured by the base station apparatus, the timer starting upon start of the SI message acquisition process.

[000154] Example Embodiment 12B: The method of Example Embodiment 8B, wherein the termination condition is dedicated for SI message acquisition process of periodically broadcasted basis second type SI messages.

[000155] Example Embodiment 13B: The method of Example Embodiment 12B, wherein the first type SI further comprises at least one termination condition dedicated for the SI message acquisition process of on-demand basis second type SI messages.

[000156] Example Embodiment 14B: A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:

transmitter circuitry configured to transmit first type system information (SI), the first type SI comprising:

availability of a second type SI message, the second type SI message comprising at least one system information block (SIB);

scheduling information for the SI message;

an indication of a delivery mode for the second type SI message, the delivery mode being either periodic broadcast or on-demand basis;

configuration parameters to configure for at least one termination condition for determination of a failure of an SI message acquisition process;

processor circuitry configured to use the transmitter circuitry to broadcast the periodic broadcast-based SI messages.

[000157] Example Embodiment 15B: The base station apparatus of Example Embodiment 14B, wherein the termination condition comprises a counter reaching a maximum value configured by the base station apparatus, the counter incremented in the case where the requested SI message was not received by the end of one reception opportunity.

[000158] Example Embodiment 16B: The base station apparatus of Example Embodiment 15B, wherein the reception opportunity is an SI window configured by the base station apparatus.

[000159] Example Embodiment 17B: The base station apparatus of Example Embodiment 14B, wherein the termination condition comprises an expiration of a timer configured by the base station apparatus, the timer starting upon start of the SI message acquisition process.

[000160] Example Embodiment 18B: The base station apparatus of Example Embodiment 14, wherein the termination condition is also used for an SI message acquisition process of on-demand basis second type SI messages.

[000161] Example Embodiment 19B: The base station apparatus of Example Embodiment 14B, wherein the termination condition is dedicated for SI message acquisition process of periodically broadcasted basis second type SI messages.

[000162] Example Embodiment 20B: The base station apparatus of Example Embodiment 19B, wherein the first type SI further comprises at least one termination condition dedicated for the SI message acquisition process of on-demand basis second type SI messages.

[000163] Example Embodiment 21B: A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, comprising:

transmitting first type system information (SI) from the base station apparatus, the first type system information comprising:

availability of a second type SI message, the second type SI message comprising at least one system information block (SIB);

scheduling information for the SI message;

an indication of a delivery mode for the second type SI message, the delivery mode being either periodic broadcast or on-demand basis;

configuration parameters to configure for at least one termination condition for determination of a failure of an SI message acquisition process;

broadcasting the periodic broadcast-based SI messages.

[000164] Example Embodiment 22B: The method of Example Embodiment 21B, wherein the termination condition comprises a counter reaching a maximum value configured by the base station apparatus, the counter incremented in the case where the requested SI message was not received by the end of one reception opportunity.

[000165] Example Embodiment 23B: The method of Example Embodiment 22B, wherein the reception opportunity is an SI window configured by the base station apparatus.

[000166] Example Embodiment 24B: The method of Example Embodiment 21B, wherein the termination condition comprises an expiration of a timer configured by the base station apparatus, the timer starting upon start of the SI message acquisition process.

[000167] Example Embodiment 25B: The method of Example Embodiment 21B, wherein the termination condition comprises an expiration of a timer configured by the base station apparatus, the timer starting upon start of the SI message acquisition process.

[000168] Example Embodiment 26B: The method of Example Embodiment 21B, wherein the termination condition is also used for an SI message acquisition process of on-demand basis second type SI messages.

[000169] Example Embodiment 27B: The method of Example Embodiment 25B, wherein the termination condition is dedicated for SI message acquisition process of periodically broadcasted basis second type SI messages.

[000170] Example Embodiment 28B: A user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the user equipment comprising:

processor circuitry configured to initiate a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising:

scheduling information of a second type SI message, the second type SI message comprising at least one system information block (SIB); and

an indication of broadcast status for the second type SI message, the indication indicating broadcasting;

receiver circuitry configured to receive the first type SIB; and

the processor circuitry further configured to initiate an SI message acquisition process to receive the SI message; wherein

in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

[000171] Example Embodiment 29B: The user equipment of Example Embodiment 28B, wherein the processor circuitry is further configured to re-initiate the SI message acquisition process based on the first type SIB acquisition process being initiated upon the failure of the SI message acquisition process.

[000172] Example Embodiment 30B: A method for a user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the method comprising:

initiating a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and

an indication of broadcast status for the SI message, the indication indicating broadcasting;

receiving the first type SIB; and

initiating an SI message acquisition process to receive the SI message; wherein

in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

[000173] Example Embodiment 31B: The method of Example Embodiment 30B, further comprising re-initiating the SI message acquisition process based on the first type SIB acquisition process being initiated upon the failure of the SI message acquisition process.

[000174] Example Embodiment 32B: A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:

transmitter circuitry configured to transmit first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB;

an indication of broadcast status for the SI message, the indication indicating broadcasting;

processor circuitry configured to use the transmitter circuitry to broadcast the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid.

[000175] Example Embodiment 33B: The base station apparatus of Example Embodiment 32B, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

[000176] Example Embodiment 34B: A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, comprising:

transmitting first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and

an indication of broadcast status for the second type SI message, the indication indicating broadcasting;

broadcasting the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid.

[000177] Example Embodiment 35B: The method of Example Embodiment 34B, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

[000178] Although the processes and methods of the disclosed embodiments may be discussed as being implemented as a software routine, some of the method steps that are disclosed therein may be performed in hardware as well as by a processor running software. As such, the embodiments may be implemented in software as executed upon a computer system, in hardware as an application specific integrated circuit or other type of hardware implementation, or a combination of software and hardware. The software routines of the disclosed embodiments are capable of being executed on any computer operating system, and is capable of being performed using any CPU architecture. The instructions of such software are stored on non-transient computer readable media.

[000179] The functions of the various elements including functional blocks, including but not limited to those labeled or described as "computer", "processor" or "controller", may be provided through the use of hardware such as circuit hardware and/or hardware capable of executing software in the form of coded instructions stored on computer readable medium. Thus, such functions and illustrated functional blocks are to be understood as being either hardware-implemented and/or computer-implemented, and thus machine-implemented.

[000180] In terms of hardware implementation, the functional blocks may include or encompass, without limitation, digital signal processor (DSP) hardware, reduced instruction set processor, hardware (e.g., digital or analog) circuitry including but not limited to application specific integrated circuit(s) [ASIC], and/or field programmable gate array(s) (FPGA(s)), and (where appropriate) state machines capable of performing such functions.

[000181] In terms of computer implementation, a computer is generally understood to comprise one or more processors or one or more controllers, and the terms computer and processor and controller may be employed interchangeably herein. When provided by a computer or processor or controller, the functions may be provided by a single dedicated computer or processor or controller, by a single shared computer or processor or controller, or by a plurality of individual computers or processors or controllers, some of which may be shared or distributed. Moreover, use of the term "processor" or "controller" shall also be construed to refer to other hardware capable of performing such functions and/or executing software, such as the example hardware recited above.

[000182] The functions of the various elements including functional blocks, including but not limited to those labeled or described as "computer", "processor" or "controller", may be provided through the use of hardware such as circuit hardware and/or hardware capable of executing software in the form of coded instructions stored on computer readable medium. Thus, such functions and illustrated functional blocks are to be understood as being either hardware-implemented and/or computer-implemented, and thus machine-implemented.

[000183] Nodes that communicate using the air interface also have suitable radio communications circuitry. Moreover, the technology can additionally be considered to be

embodied entirely within any form of computer-readable memory, such as solid-state memory, magnetic disk, or optical disk containing an appropriate set of computer instructions that would cause a processor to carry out the techniques described herein.

[000184] It will be appreciated that the technology disclosed herein is directed to solving radio communications-centric issues and is necessarily rooted in computer technology and overcomes problems specifically arising in radio communications. Moreover, in at least one of its aspects the technology disclosed herein improves the functioning of the basic function of a wireless terminal and/or node itself so that, for example, the wireless terminal and/or node can operate more effectively by prudent use of radio resources.

[000185] Although the description above contains many specificities, these should not be construed as limiting the scope of the technology disclosed herein but as merely providing illustrations of some of the presently preferred embodiments of the technology disclosed herein. Thus the scope of the technology disclosed herein should be determined by the appended claims and their legal equivalents. Therefore, it will be appreciated that the scope of the technology disclosed herein fully encompasses other embodiments which may become obvious to those skilled in the art, and that the scope of the technology disclosed herein is accordingly to be limited by nothing other than the appended claims, in which reference to an element in the singular is not intended to mean "one and only one" unless explicitly so stated, but rather "one or more." All structural, chemical, and functional equivalents to the elements of the above-described preferred embodiment that are known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed by the present claims. Moreover, it is not necessary for a device or method to address each and every problem sought to be solved by the technology disclosed herein, for it to be encompassed by the present claims. Furthermore, no element, component, or method step in the present disclosure is intended to be dedicated to the public regardless of whether the element, component, or method step is explicitly recited in the claims. No claim element herein is to be construed under the provisions of 35 U.S.C. 112, sixth paragraph, unless the element is expressly recited using the phrase "means for."

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SLA3814_1_6112-0174
	Application Number	
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Atsushi		ISHII	

Residence Information (Select One) ● US Residency Non US Residency Active US Military Service

City	Vancouver	State/Province	WA	Country of Residence	US

Mailing Address of Inventor:

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Address 2	

City	Vancouver	State/Province	WA
Postal Code	98665	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	126613		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION		
Attorney Docket Number	SLA3814_1_6112-0174	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	23	Suggested Figure for Publication (if any)	

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SLA3814_1_6112-0174
	Application Number	
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	126613		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	PCT/US2019/031674	2019-05-10

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SLA3814_1_6112-0174
	Application Number	
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2019/031674	Claims benefit of provisional	62669851	2018-05-10
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.			Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SLA3814_1_6112-0174
	Application Number	
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SLA3814_1_6112-0174
	Application Number	
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	SHARP Laboratories of America, Inc.		
Mailing Address Information For Applicant:			
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Country	US	Postal Code	98683
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SLA3814_1_6112-0174
	Application Number	
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Applicant 2 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	FG Innovation Company Limited		
Mailing Address Information For Applicant:			
Address 1	Flat 2623, 26/F, Tuen Mun Central Square		
Address 2	22 Hoi Wing Road		
City	Tuen Mun, New Territories, Hong Ko	**State/Province**	
Country	CN	Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

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If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	SLA3814_1_6112-0174
	Application Number	
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/H. Warren Burnam, Jr./			Date (YYYY-MM-DD)	2019-05-10
First Name	H. Warren	Last Name	Burnam, Jr.	Registration Number	29366

Additional Signature may be generated within this form by selecting the Add button. Add

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/408,922	05/10/2019		2340	SLA3814_1_6112-0174	8	4

CONFIRMATION NO. 1156

126613
NIXON & VANDERHYE, P.C. / SLA
901 N. Glebe Road, 11th Floor
Arlington, VA 22203

FILING RECEIPT

OC000000108355883

Date Mailed: 05/22/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Atsushi ISHII, Vancouver, WA;

Applicant(s)

SHARP Laboratories of America, Inc., Vancouver, WA;
FG Innovation Company Limited, Hong Kong, CHINA;

Power of Attorney: The patent practitioners associated with Customer Number 126613

Domestic Priority data as claimed by applicant

This application is a CON of PCT/US2019/031674 05/10/2019
which claims benefit of 62/669,851 05/10/2018

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 05/21/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/408,922**

Projected Publication Date: 11/14/2019

Non-Publication Request: No

Early Publication Request: No
Title

APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/408,922

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	8 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1				x 460 =	460
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2180

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/408,922	05/10/2019	Atsushi ISHII	SLA3814_1_6112-0174

CONFIRMATION NO. 1156

126613
NIXON & VANDERHYE, P.C. / SLA
901 N. Glebe Road, 11th Floor
Arlington, VA 22203

INFORMAL NOTICE

OC000000108355684

Date Mailed: 05/22/2019

INFORMATIONAL NOTICE TO APPLICANT

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
  Atsushi ISHII

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/hachristian/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	PATENT APPLICATION
	)	
Inventors: Atsushi Ishii	)	Attorney Docket No. SLA3814.1
	)	
Serial No.: 16/408,922	)	
	)	
Filed: May 10, 2019	)	
	)	
Title: Apparatus and Method for Acquisition of Periodically Broadcasted System Information in Wireless Communications	)	
	)	

COMBINED DECLARATION AND ASSIGNMENT FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application; OR

☒ The United States Application or PCT International application number assigned the above-identified "Serial No."; filed on the above-identified "Filed" date.

The above-identified application was made or authorized to be made by me.

I believe I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WHEREAS, the undersigned (hereinafter referred to as said "Inventor") has invented certain new and useful improvements described in the above-identified application; and

WHEREAS, Sharp Laboratories of America, Inc., a corporation of the State of Washington, (hereinafter termed "Assignee"), having a place of business at 17200 SE Mill Plain Blvd., Suite 200, Vancouver, WA 98683, wishes to acquire the entire right, title and interest in and to said application and the invention disclosed therein, and in and to all embodiments of the invention, heretofore conceived, made or discovered by said Inventor (all collectively hereinafter termed "said invention"), and in and to any and all patents, certificates of invention and other forms of protection thereon (hereinafter termed "patents") applied for or granted in the United States and/or other countries.

EX-1002
Ericsson Inc., Nokia v. Active Wireless Technologies
Page 112

NOW THEREFORE, for good and valuable consideration acknowledged by said Inventor to have been received in full from said Assignee:

1. Said Inventor hereby sells, assigns, transfers and conveys unto said Assignee, the entire right, title and interest (a) in and to said application and said invention; (b) in and to all rights to apply in any and all countries of the world for patents, certificates of inventions or other government grants on said invention, including the right to apply for patents pursuant to the International Convention for the Protection of Industrial Property or pursuant to any other convention, treaty, agreement or understanding; (c) in and to any and all applications filed and any and all patents, certificates of inventions or other governmental grants granted on said invention in the United States or any other country, including each and every application filed and each and every patent granted on any application which is a division, substitution, or continuation of any of said applications; (d) in and to each and every reissue or extension of any of said patents; and (e) in and to each and every patent claim resulting from a reexamination certificate for any and all of said patents.

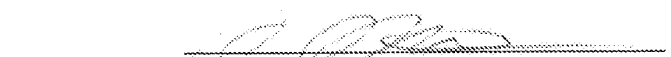
2. Said Inventor hereby covenants and agrees to cooperate with said Assignee to enable said Assignee to enjoy to the fullest extent the right, title and interest herein conveyed in the United States and other countries. Such cooperation by said Inventor shall include prompt production of pertinent facts and documents, giving of testimony, executing of petitions, oaths, specifications, declarations or other papers, and other assistance all to the extent deemed necessary or desirable by said Assignee (a) for perfecting in said Assignee the right, title and interest herein conveyed; (b) for complying with any duty of disclosure; (c) for prosecuting any of said applications; (d) for filing and prosecuting substitute, divisional, continuing or additional applications covering said invention; (e) for filing and prosecuting applications for reissue of any of said patents; (f) for interference or other priority proceedings involving said invention; and (g) for legal proceedings involving said invention and any applications therefore and any patents granted thereon, including without limitation opposition proceedings, cancellation proceedings, priority contests, public use proceedings, reexamination proceedings, compulsory licensing proceedings, infringement actions and court actions; provided, however, that the expense incurred by said Inventor in providing such cooperation shall be paid for by said Assignee.

3. The terms and covenants of this Assignment shall inure to the benefit of said Assignee, its successors, assigns and other legal representatives, and shall be binding upon said Inventor, said Inventor's heirs, legal representatives and assigns.

4. Said Inventor hereby warrants and represents that said Inventor has not entered and will not enter into any assignment, contract, or understanding in conflict with this Assignment.

IN WITNESS WHEREOF, the said Inventor has executed this Declaration and Assignment on the date given below:

Legal Name of Inventor: Atsushi Ishii



(Signature)

5/22/2019

(Date)

EX-1002
Ericsson Inc., Nokia v. Active Wireless Technologies
Page 113

Electronic Acknowledgement Receipt

EFS ID:	36330339
Application Number:	16408922
International Application Number:	
Confirmation Number:	1156
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Customer Number:	126613
Filer:	H. Warren Burnam/Linda Hull
Filer Authorized By:	H. Warren Burnam
Attorney Docket Number:	SLA3814_1_6112-0174
Receipt Date:	18-JUN-2019
Filing Date:	10-MAY-2019
Time Stamp:	13:10:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	SLA3814_1_6112-0174_combined_Dec_Assign.pdf	2218110 908f7402f4308462ea3c5de391f29c39442b2884	no	2

Warnings:

Information:	
Total Files Size (in bytes):	2218110

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT5577224

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT

CONVEYING PARTY DATA

Name	Execution Date
ATSUSHI ISHII	05/22/2019

RECEIVING PARTY DATA

Name:	SHARP LABORATORIES OF AMERICA, INC.
Street Address:	17200 SE MILL PLAIN BLVD., SUITE 200
City:	VANCOUVER
State/Country:	WASHINGTON
Postal Code:	98683

PROPERTY NUMBERS Total: 1

Property Type	Number
Application Number:	16408922

CORRESPONDENCE DATA

Fax Number: (703)816-4100

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.

Phone: 7038164027
Email: ptomail@nixonvan.com
Correspondent Name: H. WARREN BURNAM, JR.
Address Line 1: 901 N. GLEBE ROAD, 11TH FLOOR
Address Line 4: ARLINGTON, VIRGINIA 22203

ATTORNEY DOCKET NUMBER:	SLA3814_1_6112-0174
NAME OF SUBMITTER:	H. WARREN BURNAM, JR.
SIGNATURE:	/H. Warren Burnam, Jr./
DATE SIGNED:	06/18/2019
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 2
source=SLA3814_1_6112-0174_combined_Dec_Assign#page1.tif
source=SLA3814_1_6112-0174_combined_Dec_Assign#page2.tif

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	PATENT APPLICATION
	)	
Inventors: Atsushi Ishii	)	Attorney Docket No. SLA3814.1
	)	
Serial No.: 16/408,922	)	
	)	
Filed: May 10, 2019	)	
	)	
Title: Apparatus and Method for Acquisition of Periodically Broadcasted System Information in Wireless Communications	)	
	)	

COMBINED DECLARATION AND ASSIGNMENT FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application; OR

☒ The United States Application or PCT International application number assigned the above-identified "Serial No."; filed on the above-identified "Filed" date.

The above-identified application was made or authorized to be made by me.

I believe I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WHEREAS, the undersigned (hereinafter referred to as said "Inventor") has invented certain new and useful improvements described in the above-identified application; and

WHEREAS, Sharp Laboratories of America, Inc., a corporation of the State of Washington, (hereinafter termed "Assignee"), having a place of business at 17200 SE Mill Plain Blvd., Suite 200, Vancouver, WA 98683, wishes to acquire the entire right, title and interest in and to said application and the invention disclosed therein, and in and to all embodiments of the invention, heretofore conceived, made or discovered by said Inventor (all collectively hereinafter termed "said invention"), and in and to any and all patents, certificates of invention and other forms of protection thereon (hereinafter termed "patents") applied for or granted in the United States and/or other countries.

EX-1002
Ericsson Inc., Nokia v. Active Wireless Technologies
Page 117

NOW THEREFORE, for good and valuable consideration acknowledged by said Inventor to have been received in full from said Assignee:

1. Said Inventor hereby sells, assigns, transfers and conveys unto said Assignee, the entire right, title and interest (a) in and to said application and said invention; (b) in and to all rights to apply in any and all countries of the world for patents, certificates of inventions or other government grants on said invention, including the right to apply for patents pursuant to the International Convention for the Protection of Industrial Property or pursuant to any other convention, treaty, agreement or understanding; (c) in and to any and all applications filed and any and all patents, certificates of inventions or other governmental grants granted on said invention in the United States or any other country, including each and every application filed and each and every patent granted on any application which is a division, substitution, or continuation of any of said applications; (d) in and to each and every reissue or extension of any of said patents; and (e) in and to each and every patent claim resulting from a reexamination certificate for any and all of said patents.

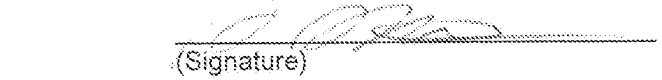
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4. Said Inventor hereby warrants and represents that said Inventor has not entered and will not enter into any assignment, contract, or understanding in conflict with this Assignment.

IN WITNESS WHEREOF, the said Inventor has executed this Declaration and Assignment on the date given below:

Legal Name of Inventor: Atsushi Ishii



(Signature)

5/22/2019

(Date)

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Sheet 1 of 1

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U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
		2017/0064764	3-2017	Qualcomm Incorporated			
		2017/0251500	8-2017	Samsung Electronics Co., Ltd.			
		2015/0038142	2-2015	Broadcom Corporation			
		2014/0086173	3-2014	Interdigital Patent Holdings, Inc.			
		2015/0215757	7-2015	Miskiewicz et al.			
		2017/0325049	11-2017	Panasonic Intellectual Property Corporation of America			
		2010/0323714	12-2010	Schmidt et al.			

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		DOCUMENT	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
		WO 2017/197063 A1	11-2017	WIPO/PCT				

OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)

		International Search Report and Written Opinion mailed 23 July 2019 in PCT application PCT/US2019/031674

*Examiner		Date Considered	

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(54) Title: DISTRIBUTED CONTROL IN WIRELESS SYSTEMS

(57) Abstract: Systems, procedures, and instrumentalities are disclosed for distributed control in wireless systems, such as 5G flexible radio access technology (RAT) (5gFLEX). Example procedures are provided for WTRU and network operation associated with a distributed control plane architecture, connectionless data transfer and dedicated system information acquisition. Distributed control may be provided, for example, by replicating a plurality of access control functions (ACFs) using a plurality of instances in a plurality of different transmission/reception points (TRPs) with multi-connectivity. The plurality of TRPs may concurrently provide control services to a WTRU. Centralized control functions may manage core network connectivity and/or a plurality of user plane instances for the WTRU and/or may facilitate coordination between the plurality of ACF instances for the WTRU in the plurality of different TRPs of the WTRU's configuration.

DISTRIBUTED CONTROL IN WIRELESS SYSTEMS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 62/442,317 filed on January 4, 2017; U.S. Provisional Patent Application No. 62/416,499, filed on November 2, 2016; U.S. Provisional Patent Application No. 62/400,810, filed on September 28, 2016; and U.S. Provisional Patent Application No. 62/334,704, filed on May 11, 2016, the contents of all of which being hereby incorporated by reference as if fully set-forth herein in their respective entirety, for all purposes.

BACKGROUND

[0002] Mobile communications continue to evolve. A fifth generation may be referred to as 5G. A previous (legacy) generation of mobile communication may be, for example, fourth generation (4G) long term evolution (LTE).

SUMMARY

[0003] Systems, procedures, and instrumentalities (e.g., aspects of entities, interfaces and/or procedures in a wireless transmit/receive unit (WTRU) and/or network layers L1, L2, l3) are disclosed for distributed control in wireless systems, such as 5G flexible radio access technology (RAT) (5gFLEX). Example procedures are provided for WTRU and network operation associated with a distributed control plane architecture, connectionless data transfer and/or dedicated system information acquisition. Distributed control may be provided, for example, by replicating a plurality of access control functions (ACFs) using a plurality of instances in a plurality of different transmission/reception points (TRPs) with multi-connectivity. The plurality of TRPs may concurrently provide control services to a WTRU. Centralized control functions may manage core network connectivity and/or a plurality of user plane instances for the WTRU and/or may facilitate coordination between the plurality of ACF instances for the WTRU in the plurality of different TRPs of the WTRU's configuration. For example, there may be a first

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access plane between the WTRU and a first TRP that provides a first ACF for the WTRU, a second access plane between the WTRU and a second TRP that provides a second ACF for the WTRU, a RAN central control plane between the WTRU and a first RAN central control function (RCCF) and/or a RAN central user plane between the WTRU and a RAN central user function (RCUF).

[0004] A WTRU may use assistance information for beamformed system information delivery. Assistance information may be determined and/or transmitted.

[0005] A WTRU may determine when to apply and/or activate on-demand system information. A WTRU may determine when to delete and/or deactivate on-demand system information.

[0006] A WTRU may have saved instructions in memory executable by a processor and/or received from a wireless network via a message (e.g., rules) for triggering a system information ("SI") request procedure. A WTRU may also have saved instructions in memory executable by a processor and/or received from a wireless network via a message for performing an SI request, (e.g., using a random access channel "RACH"), and/or msg3 and/or handling of networks.

[0007] A wireless transmit/receive unit (WTRU) may be in communication with a communication network. The WTRU may comprise a memory. The WTRU may comprise a processor. The processor may be configured to determine to request one or more system information (SI) messages from the communication network. The processor may be configured to determine if a transmission of the one or more SI message from the communication network will utilize at least one beamformed communication based on one or more communication parameters. The WTRU may comprise a transceiver. The transceiver may be configured to receive at least one of the one or more SI messages from the communication network via the at least one beamformed communication.

[0008] A wireless transmit/receive unit (WTRU) may be in communication with a communication network. The WTRU may comprise a memory. The WTRU may comprise a processor. The processor may be configured to determine to request one or more system information (SI) messages from the communication network. The processor may be configured to conduct a beam sweep operation of one or more downlink (DL) beams transmitted from the communication network. The processor may be configured to identify at least one DL beam of the one or more DL beams via which to receive the one or more on-demand SI messages based at least in part on the beam sweep operation. The processor may be configured to determine one or more uplink (UL) resources with which to communicate information for the WTRU reception of the one or more on-demand SI messages. The information for the WTRU reception may include

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the at least one DL beam. The processor may be configured to initiate the request for the one or more on-demand SI messages from the communication network. The WTRU may comprise a transceiver. The transceiver may be configured to send the request for the one or more on-demand SI messages to the communication network using the one or more UL resources. The request may include the information for the WTRU reception of the one or more on-demand SI messages. The transceiver may be configured to receive at least one of the one or more on-demand SI messages from the communication network via the at least one DL beam.

[0009] A wireless transmit/receive unit (WTRU) may be in communication with a communication network. The WTRU may comprise a memory. The WTRU may comprise a transceiver. The transceiver may be configured to receive system information (SI) from the communication network at a first-time instance. The WTRU may comprise a processor. The processor may be configured to determine a first-reference identifier (ID) that corresponds to at least some of the SI of the first-time instance. The processor may be configured to determine a first-value identifier (ID) that corresponds to the at least some of the SI of the first-time instance. The processor may be configured to associate the first-reference ID and/or the first-value ID with the at least some of the SI of the first-time instance. The processor may be configured to utilize the at least some of the SI of the first-time instance in communication with the communication network. The processor may be configured to search the memory for stored SI of a previous-time instance that is associated with the same first-reference ID of the at least some of the SI of the first-time instance. The processor may be configured to store the at least some of the SI of the first-time instance upon no stored SI of the previous-time instance associated with the same first-reference ID being found. The processor may be configured to replace stored SI of the previous-time instance associated with the same first-reference ID with the at least some of the SI of the first-time instance upon a value ID associated with the stored SI of the previous-time instance associated with the same first-reference ID being different from the first-value ID.

[0010] A wireless transmit/receive unit (WTRU) may be in communication with a communication network. The WTRU may comprise a memory. The WTRU may comprise a processor. The processor may be configured to determine to request other system information (other-SI) from the communication network. The WTRU may be configured to initiate the request for the other-SI from the communication network as part of a Radom Access Channel (RACH) procedure. The WTRU may comprise a transceiver. The transceiver may be configured to transmit a RACH signal. The RACH signal may include the request for the other-SI in a random access preamble of the RACH signal. The processor may be configured to monitor for a message that includes a minimum SI from the communication network for a

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predetermined period of time following the transmission of the RACH signal. The processor may be configured to determine if the requested other-SI is included in the message that includes the minimum SI upon a detection of the message that includes the minimum SI. The processor may initiate one or more retransmissions of the RACH signal the message that includes the minimum SI not being detected, and/or the other-SI is determined to not be included in a detected message that includes the minimum SI.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1A is a system diagram of an example communications system in which one or more disclosed embodiments may be implemented.

[0012] FIG. 1B is a system diagram of an example WTRU that may be used within the communications system illustrated in FIG. 1A.

[0013] FIG. 1C is a system diagram of an example radio access network and an example core network that may be used within the communications system illustrated in FIG. 1A.

[0014] FIG. 1D is a system diagram of another example radio access network and another example core network that may be used within the communications system illustrated in FIG. 1A.

[0015] FIG. 1E is a system diagram of another example radio access network and another example core network that may be used within the communications system illustrated in FIG. 1A.

[0016] FIG. 2 is an example of transmission bandwidths.

[0017] FIG. 3 is an example of flexible spectrum allocation.

[0018] FIG. 4 is an example of types of assistance modes.

[0019] FIG. 5 is an example of tri-plane architecture.

[0020] FIG. 6 is an example of non-overlapping windows for minimum-system information (SI) and other-SI.

[0021] FIG. 7 is an example of overlapping windows for other-SI and minimum-SI.

[0022] FIG. 8A and 8B together illustrate an example of an on-demand SI request in a beamformed context.

DETAILED DESCRIPTION

[0023] A detailed description of illustrative embodiments will now be described with reference to the various Figures. Although this description provides a detailed example of

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possible implementations, it should be noted that the details are intended to be examples and in no way limit the scope of the application.

[0024] FIG. 1A is a diagram of an example communications system 100 in which one or more disclosed embodiments may be implemented. The communications system 100 may be a multiple access system that provides content, such as voice, data, video, messaging, broadcast, etc., to multiple wireless users. The communications system 100 may enable multiple wireless users to access such content through the sharing of system resources, including wireless bandwidth. For example, the communications system 100 may employ one or more channel access methods, such as code division multiple access (CDMA), time division multiple access (TDMA), frequency division multiple access (FDMA), orthogonal FDMA (OFDMA), single-carrier FDMA (SC-FDMA), and the like.

[0025] As shown in FIG. 1A, the communications system 100 may include wireless transmit/receive units (WTRUs), e.g., WTRUs, 102a, 102b, 102c, and/or 102d (which generally or collectively may be referred to as WTRU 102), a radio access network (RAN) 103/104/105, a core network 106/107/109, a public switched telephone network (PSTN) 108, the Internet 110, and other networks 112, though it will be appreciated that the disclosed embodiments contemplate any number of WTRUs, base stations, networks, and/or network elements. Each of the WTRUs 102a, 102b, 102c, 102d may be any type of device configured to operate and/or communicate in a wireless environment. By way of example, the WTRUs 102a, 102b, 102c, 102d may be configured to transmit and/or receive wireless signals and may include user equipment (UE), a mobile station, a fixed or mobile subscriber unit, a pager, a cellular telephone, a personal digital assistant (PDA), a smartphone, a laptop, a netbook, a personal computer, a wireless sensor, consumer electronics, and the like.

[0026] The communications system 100 may also include a base station 114a and a base station 114b. Each of the base stations 114a, 114b may be any type of device configured to wirelessly interface with at least one of the WTRUs 102a, 102b, 102c, 102d to facilitate access to one or more communication networks, such as the core network 106/107/109, the Internet 110, and/or the networks 112. By way of example, the base stations 114a, 114b may be a base transceiver station (BTS), a Node-B, an eNode B, a Home Node B, a Home eNode B, a site controller, an access point (AP), a wireless router, and the like. While the base stations 114a, 114b are each depicted as a single element, it will be appreciated that the base stations 114a, 114b may include any number of interconnected base stations and/or network elements.

[0027] The base station 114a may be part of the RAN 103/104/105, which may also include other base stations and/or network elements (not shown), such as a base station controller (BSC),

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a radio network controller (RNC), relay nodes, etc. The base station 114a and/or the base station 114b may be configured to transmit and/or receive wireless signals within a particular geographic region, which may be referred to as a cell (not shown). The cell may further be divided into cell sectors. For example, the cell associated with the base station 114a may be divided into three sectors. Thus, in some embodiments, the base station 114a may include three transceivers, e.g., one for each sector of the cell. In another embodiment, the base station 114a may employ multiple-input multiple output (MIMO) technology and, therefore, may utilize multiple transceivers for each sector of the cell.

[0028] The base stations 114a, 114b may communicate with one or more of the WTRUs 102a, 102b, 102c, 102d over an air interface 115/116/117, which may be any suitable wireless communication link (e.g., radio frequency (RF), microwave, infrared (IR), ultraviolet (UV), visible light, etc.). The air interface 115/116/117 may be established using any suitable radio access technology (RAT).

[0029] More specifically, as noted above, the communications system 100 may be a multiple access system and may employ one or more channel access schemes, such as CDMA, TDMA, FDMA, OFDMA, SC-FDMA, and the like. For example, the base station 114a in the RAN 103/104/105 and the WTRUs 102a, 102b, 102c may implement a radio technology such as Universal Mobile Telecommunications System (UMTS) Terrestrial Radio Access (UTRA), which may establish the air interface 115/116/117 using wideband CDMA (WCDMA). WCDMA may include communication protocols such as High-Speed Packet Access (HSPA) and/or Evolved HSPA (HSPA+). HSPA may include High-Speed Downlink Packet Access (HSDPA) and/or High-Speed Uplink Packet Access (HSUPA).

[0030] In another embodiment, the base station 114a and the WTRUs 102a, 102b, 102c may implement a radio technology such as Evolved UMTS Terrestrial Radio Access (E-UTRA), which may establish the air interface 115/116/117 using Long Term Evolution (LTE) and/or LTE-Advanced (LTE-A).

[0031] In other embodiments, the base station 114a and the WTRUs 102a, 102b, 102c may implement radio technologies such as IEEE 802.16 (e.g., Worldwide Interoperability for Microwave Access (WiMAX)), CDMA2000, CDMA2000 1X, CDMA2000 EV-DO, Interim Standard 2000 (IS-2000), Interim Standard 95 (IS-95), Interim Standard 856 (IS-856), Global System for Mobile communications (GSM), Enhanced Data rates for GSM Evolution (EDGE), GSM EDGE (GERAN), and the like.

[0032] The base station 114b in FIG. 1A may be a wireless router, Home Node B, Home eNode B, or access point, for example, and may utilize any suitable RAT for facilitating wireless

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connectivity in a localized area, such as a place of business, a home, a vehicle, a campus, and the like. In some embodiments, the base station 114b and the WTRUs 102c, 102d may implement a radio technology such as IEEE 802.11 to establish a wireless local area network (WLAN). In another embodiment, the base station 114b and the WTRUs 102c, 102d may implement a radio technology such as IEEE 802.15 to establish a wireless personal area network (WPAN). In yet another embodiment, the base station 114b and the WTRUs 102c, 102d may utilize a cellular-based RAT (e.g., WCDMA, CDMA2000, GSM, LTE, LTE-A, etc.) to establish a picocell or femtocell. As shown in FIG. 1A, the base station 114b may have a direct connection to the Internet 110. Thus, the base station 114b may not be required to access the Internet 110 via the core network 106/107/109.

[0033] The RAN 103/104/105 may be in communication with the core network 106/107/109, which may be any type of network configured to provide voice, data, applications, and/or voice over internet protocol (VoIP) services to one or more of the WTRUs 102a, 102b, 102c, 102d. For example, the core network 106/107/109 may provide call control, billing services, mobile location-based services, pre-paid calling, Internet connectivity, video distribution, etc., and/or perform high-level security functions, such as user authentication. Although not shown in FIG. 1A, it will be appreciated that the RAN 103/104/105 and/or the core network 106/107/109 may be in direct or indirect communication with other RANs that employ the same RAT as the RAN 103/104/105 or a different RAT. For example, in addition to being connected to the RAN 103/104/105, which may be utilizing an E-UTRA radio technology, the core network 106/107/109 may also be in communication with another RAN (not shown) employing a GSM radio technology.

[0034] The core network 106/107/109 may also serve as a gateway for the WTRUs 102a, 102b, 102c, 102d to access the PSTN 108, the Internet 110, and/or other networks 112. The PSTN 108 may include circuit-switched telephone networks that provide plain old telephone service (POTS). The Internet 110 may include a global system of interconnected computer networks and devices that use common communication protocols, such as the transmission control protocol (TCP), user datagram protocol (UDP) and the internet protocol (IP) in the TCP/IP internet protocol suite. The networks 112 may include wired or wireless communications networks owned and/or operated by other service providers. For example, the networks 112 may include another core network connected to one or more RANs, which may employ the same RAT as the RAN 103/104/105 or a different RAT.

[0035] Some or all of the WTRUs 102a, 102b, 102c, 102d in the communications system 100 may include multi-mode capabilities, e.g., the WTRUs 102a, 102b, 102c, 102d may include

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multiple transceivers for communicating with different wireless networks over different wireless links. For example, the WTRU 102c shown in FIG. 1A may be configured to communicate with the base station 114a, which may employ a cellular-based radio technology, and with the base station 114b, which may employ an IEEE 802 radio technology.

[0036] FIG. 1B is a system diagram of an example WTRU 102. As shown in FIG. 1B, the WTRU 102 may include a processor 118, a transceiver 120, a transmit/receive element 122, a speaker/microphone 124, a keypad 126, a display/touchpad 128, non-removable memory 130, removable memory 132, a power source 134, a global positioning system (GPS) chipset 136, and other peripherals 138. It will be appreciated that the WTRU 102 may include any sub-combination of the foregoing elements while remaining consistent with an embodiment. Also, embodiments contemplate that the base stations 114a and 114b, and/or the nodes that base stations 114a and 114b may represent, such as but not limited to transceiver station (BTS), a Node-B, a site controller, an access point (AP), a home node-B, an evolved home node-B (eNodeB), a home evolved node-B (HeNB or HeNodeB), a home evolved node-B gateway, and proxy nodes, among others, may include some or all of the elements depicted in FIG. 1B and described herein.

[0037] The processor 118 may be a general purpose processor, a special purpose processor, a conventional processor, a digital signal processor (DSP), a plurality of microprocessors, one or more microprocessors in association with a DSP core, a controller, a microcontroller, Application Specific Integrated Circuits (ASICs), Field Programmable Gate Array (FPGAs) circuits, any other type of integrated circuit (IC), a state machine, and the like. The processor 118 may perform signal coding, data processing, power control, input/output processing, and/or any other functionality that enables the WTRU 102 to operate in a wireless environment. The processor 118 may be coupled to the transceiver 120, which may be coupled to the transmit/receive element 122. While FIG. 1B depicts the processor 118 and the transceiver 120 as separate components, it will be appreciated that the processor 118 and the transceiver 120 may be integrated together in an electronic package or chip.

[0038] The transmit/receive element 122 may be configured to transmit signals to, or receive signals from, a base station (e.g., the base station 114a) over the air interface 115/116/117. For example, in some embodiments, the transmit/receive element 122 may be an antenna configured to transmit and/or receive RF signals. In another embodiment, the transmit/receive element 122 may be an emitter/detector configured to transmit and/or receive IR, UV, or visible light signals, for example. In yet another embodiment, the transmit/receive element 122 may be configured to

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transmit and receive RF and/or light signals. It will be appreciated that the transmit/receive element 122 may be configured to transmit and/or receive any combination of wireless signals.

[0039] In addition, although the transmit/receive element 122 is depicted in FIG. 1B as a single element, the WTRU 102 may include any number of transmit/receive elements 122. More specifically, the WTRU 102 may employ MIMO technology. Thus, in some embodiments, the WTRU 102 may include two or more transmit/receive elements 122 (e.g., multiple antennas) for transmitting and receiving wireless signals over the air interface 115/116/117.

[0040] The transceiver 120 may be configured to modulate the signals that are to be transmitted by the transmit/receive element 122 and to demodulate the signals that are received by the transmit/receive element 122. As noted above, the WTRU 102 may have multi-mode capabilities. Thus, the transceiver 120 may include multiple transceivers for enabling the WTRU 102 to communicate via multiple RATs, such as UTRA and IEEE 802.11, for example.

[0041] The processor 118 of the WTRU 102 may be coupled to, and may receive user input data from, the speaker/microphone 124, the keypad 126, and/or the display/touchpad 128 (e.g., a liquid crystal display (LCD) display unit or organic light-emitting diode (OLED) display unit). The processor 118 may also output user data to the speaker/microphone 124, the keypad 126, and/or the display/touchpad 128. In addition, the processor 118 may access information from, and store data in, any type of suitable memory, such as the non-removable memory 130 and/or the removable memory 132. The non-removable memory 130 may include random-access memory (RAM), read-only memory (ROM), a hard disk, or any other type of memory storage device. The removable memory 132 may include a subscriber identity module (SIM) card, a memory stick, a secure digital (SD) memory card, and the like. In other embodiments, the processor 118 may access information from, and store data in, memory that is not physically located on the WTRU 102, such as on a server or a home computer (not shown).

[0042] The processor 118 may receive power from the power source 134, and may be configured to distribute and/or control the power to the other components in the WTRU 102. The power source 134 may be any suitable device for powering the WTRU 102. For example, the power source 134 may include one or more dry cell batteries (e.g., nickel-cadmium (NiCd), nickel-zinc (NiZn), nickel metal hydride (NiMH), lithium-ion (Li-ion), etc.), solar cells, fuel cells, and the like.

[0043] The processor 118 may also be coupled to the GPS chipset 136, which may be configured to provide location information (e.g., longitude and latitude) regarding the current location of the WTRU 102. In addition to, or in lieu of, the information from the GPS chipset 136, the WTRU 102 may receive location information over the air interface 115/116/117 from a

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base station (e.g., base stations 114a, 114b) and/or determine its location based on the timing of the signals being received from two or more nearby base stations. It will be appreciated that the WTRU 102 may acquire location information by way of any suitable location-determination implementation while remaining consistent with an embodiment.

[0044] The processor 118 may further be coupled to other peripherals 138, which may include one or more software and/or hardware modules that provide additional features, functionality and/or wired or wireless connectivity. For example, the peripherals 138 may include an accelerometer, an e-compass, a satellite transceiver, a digital camera (for photographs or video), a universal serial bus (USB) port, a vibration device, a television transceiver, a hands free headset, a Bluetooth® module, a frequency modulated (FM) radio unit, a digital music player, a media player, a video game player module, an Internet browser, and the like.

[0045] FIG. 1C is a system diagram of the RAN 103 and the core network 106 according to an embodiment. As noted above, the RAN 103 may employ a UTRA radio technology to communicate with the WTRUs 102a, 102b, 102c over the air interface 115. The RAN 103 may also be in communication with the core network 106. As shown in FIG. 1C, the RAN 103 may include Node-Bs 140a, 140b, 140c, which may each include one or more transceivers for communicating with the WTRUs 102a, 102b, 102c over the air interface 115. The Node-Bs 140a, 140b, 140c may each be associated with a particular cell (not shown) within the RAN 103. The RAN 103 may also include RNCs 142a, 142b. It will be appreciated that the RAN 103 may include any number of Node-Bs and RNCs while remaining consistent with an embodiment.

[0046] As shown in FIG. 1C, the Node-Bs 140a, 140b may be in communication with the RNC 142a. Additionally, the Node-B 140c may be in communication with the RNC 142b. The Node-Bs 140a, 140b, 140c may communicate with the respective RNCs 142a, 142b via an Iub interface. The RNCs 142a, 142b may be in communication with one another via an Iur interface. Each of the RNCs 142a, 142b may be configured to control the respective Node-Bs 140a, 140b, 140c to which it is connected. In addition, each of the RNCs 142a, 142b may be configured to carry out or support other functionality, such as outer loop power control, load control, admission control, packet scheduling, handover control, macrodiversity, security functions, data encryption, and the like.

[0047] The core network 106 shown in FIG. 1C may include a media gateway (MGW) 144, a mobile switching center (MSC) 146, a serving GPRS support node (SGSN) 148, and/or a gateway GPRS support node (GGSN) 150. While each of the foregoing elements are depicted as part of the core network 106, it will be appreciated that any one of these elements may be owned and/or operated by an entity other than the core network operator.

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[0048] The RNC 142a in the RAN 103 may be connected to the MSC 146 in the core network 106 via an IuCS interface. The MSC 146 may be connected to the MGW 144. The MSC 146 and the MGW 144 may provide the WTRUs 102a, 102b, 102c with access to circuit-switched networks, such as the PSTN 108, to facilitate communications between the WTRUs 102a, 102b, 102c and traditional land-line communications devices.

[0049] The RNC 142a in the RAN 103 may also be connected to the SGSN 148 in the core network 106 via an IuPS interface. The SGSN 148 may be connected to the GGSN 150. The SGSN 148 and the GGSN 150 may provide the WTRUs 102a, 102b, 102c with access to packet-switched networks, such as the Internet 110, to facilitate communications between and the WTRUs 102a, 102b, 102c and IP-enabled devices.

[0050] As noted above, the core network 106 may also be connected to the networks 112, which may include other wired or wireless networks that are owned and/or operated by other service providers.

[0051] FIG. 1D is a system diagram of the RAN 104 and the core network 107 according to an embodiment. As noted above, the RAN 104 may employ an E-UTRA radio technology to communicate with the WTRUs 102a, 102b, 102c over the air interface 116. The RAN 104 may also be in communication with the core network 107.

[0052] The RAN 104 may include eNode-Bs 160a, 160b, 160c, though it will be appreciated that the RAN 104 may include any number of eNode-Bs while remaining consistent with an embodiment. The eNode-Bs 160a, 160b, 160c may each include one or more transceivers for communicating with the WTRUs 102a, 102b, 102c over the air interface 116. In some embodiments, the eNode-Bs 160a, 160b, 160c may implement MIMO technology. Thus, the eNode-B 160a, for example, may use multiple antennas to transmit wireless signals to, and receive wireless signals from, the WTRU 102a.

[0053] Each of the eNode-Bs 160a, 160b, 160c may be associated with a particular cell (not shown) and may be configured to handle radio resource management decisions, handover decisions, scheduling of users in the uplink (UL) and/or downlink (DL), and the like. As shown in FIG. 1D, the eNode-Bs 160a, 160b, 160c may communicate with one another over an X2 interface.

[0054] The core network 107 shown in FIG. 1D may include a mobility management gateway (MME) 162, a serving gateway 164, and a packet data network (PDN) gateway 166. While each of the foregoing elements are depicted as part of the core network 107, it will be appreciated that any one of these elements may be owned and/or operated by an entity other than the core network operator.

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[0055] The MME 162 may be connected to each of the eNode-Bs 160a, 160b, 160c in the RAN 104 via an S1 interface and may serve as a control node. For example, the MME 162 may be responsible for authenticating users of the WTRUs 102a, 102b, 102c, bearer activation/deactivation, selecting a particular serving gateway during an initial attach of the WTRUs 102a, 102b, 102c, and the like. The MME 162 may also provide a control plane function for switching between the RAN 104 and other RANs (not shown) that employ other radio technologies, such as GSM or WCDMA.

[0056] The serving gateway 164 may be connected to each of the eNode-Bs 160a, 160b, 160c in the RAN 104 via the S1 interface. The serving gateway 164 may generally route and forward user data packets to/from the WTRUs 102a, 102b, 102c. The serving gateway 164 may also perform other functions, such as anchoring user planes during inter-eNode B handovers, triggering paging when downlink data is available for the WTRUs 102a, 102b, 102c, managing and storing contexts of the WTRUs 102a, 102b, 102c, and the like.

[0057] The serving gateway 164 may also be connected to the PDN gateway 166, which may provide the WTRUs 102a, 102b, 102c with access to packet-switched networks, such as the Internet 110, to facilitate communications between the WTRUs 102a, 102b, 102c and IP-enabled devices.

[0058] The core network 107 may facilitate communications with other networks. For example, the core network 107 may provide the WTRUs 102a, 102b, 102c with access to circuit-switched networks, such as the PSTN 108, to facilitate communications between the WTRUs 102a, 102b, 102c and traditional land-line communications devices. For example, the core network 107 may include, or may communicate with, an IP gateway (e.g., an IP multimedia subsystem (IMS) server) that serves as an interface between the core network 107 and the PSTN 108. In addition, the core network 107 may provide the WTRUs 102a, 102b, 102c with access to the networks 112, which may include other wired or wireless networks that are owned and/or operated by other service providers.

[0059] FIG. 1E is a system diagram of the RAN 105 and the core network 109 according to an embodiment. The RAN 105 may be an access service network (ASN) that employs IEEE 802.16 radio technology to communicate with the WTRUs 102a, 102b, 102c over the air interface 117. As will be further discussed below, the communication links between the different functional entities of the WTRUs 102a, 102b, 102c, the RAN 105, and the core network 109 may be defined as reference points.

[0060] As shown in FIG. 1E, the RAN 105 may include base stations 180a, 180b, 180c, and an ASN gateway 182, though it will be appreciated that the RAN 105 may include any number

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of base stations and ASN gateways while remaining consistent with an embodiment. The base stations 180a, 180b, 180c may each be associated with a particular cell (not shown) in the RAN 105 and may each include one or more transceivers for communicating with the WTRUs 102a, 102b, 102c over the air interface 117. In some embodiments, the base stations 180a, 180b, 180c may implement MIMO technology. Thus, the base station 180a, for example, may use multiple antennas to transmit wireless signals to, and receive wireless signals from, the WTRU 102a. The base stations 180a, 180b, 180c may also provide mobility management functions, such as handoff triggering, tunnel establishment, radio resource management, traffic classification, quality of service (QoS) policy enforcement, and the like. The ASN gateway 182 may serve as a traffic aggregation point and may be responsible for paging, caching of subscriber profiles, routing to the core network 109, and the like.

[0061] The air interface 117 between the WTRUs 102a, 102b, 102c and the RAN 105 may be defined as an R1 reference point that implements the IEEE 802.16 specification. In addition, each of the WTRUs 102a, 102b, 102c may establish a logical interface (not shown) with the core network 109. The logical interface between the WTRUs 102a, 102b, 102c and the core network 109 may be defined as an R2 reference point, which may be used for authentication, authorization, IP host configuration management, and/or mobility management.

[0062] The communication link between each of the base stations 180a, 180b, 180c may be defined as an R8 reference point that includes protocols for facilitating WTRU handovers and the transfer of data between base stations. The communication link between the base stations 180a, 180b, 180c and the ASN gateway 182 may be defined as an R6 reference point. The R6 reference point may include protocols for facilitating mobility management based on mobility events associated with each of the WTRUs 102a, 102b, 102c.

[0063] As shown in FIG. 1E, the RAN 105 may be connected to the core network 109. The communication link between the RAN 105 and the core network 109 may defined as an R3 reference point that includes protocols for facilitating data transfer and mobility management capabilities, for example. The core network 109 may include a mobile IP home agent (MIP-HA) 184, an authentication, authorization, accounting (AAA) server 186, and a gateway 188. While each of the foregoing elements are depicted as part of the core network 109, it will be appreciated that any one of these elements may be owned and/or operated by an entity other than the core network operator.

[0064] The MIP-HA may be responsible for IP address management, and may enable the WTRUs 102a, 102b, 102c to roam between different ASNs and/or different core networks. The MIP-HA 184 may provide the WTRUs 102a, 102b, 102c with access to packet-switched

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networks, such as the Internet 110, to facilitate communications between the WTRUs 102a, 102b, 102c and IP-enabled devices. The AAA server 186 may be responsible for user authentication and for supporting user services. The gateway 188 may facilitate interworking with other networks. For example, the gateway 188 may provide the WTRUs 102a, 102b, 102c with access to circuit-switched networks, such as the PSTN 108, to facilitate communications between the WTRUs 102a, 102b, 102c and traditional land-line communications devices. In addition, the gateway 188 may provide the WTRUs 102a, 102b, 102c with access to the networks 112, which may include other wired or wireless networks that are owned and/or operated by other service providers.

[0065] Although not shown in FIG. 1E, RAN 105 may be connected to other ASNs and the core network 109 may be connected to other core networks. The communication link between the RAN 105 the other ASNs may be defined as an R4 reference point, which may include protocols for coordinating the mobility of the WTRUs 102a, 102b, 102c between the RAN 105 and the other ASNs. The communication link between the core network 109 and the other core networks may be defined as an R5 reference, which may include protocols for facilitating interworking between home core networks and visited core networks.

[0066] In view of Figures 1A-1E, and the corresponding description of Figures 1A-1E, one or more, or all, of the functions described herein with regard to one or more of: WTRU 102a-d, Base Station 114a-b, Node B 140a-c, RNC 142a-b, MSC 146, SGSN 148, MGW 144, CGSN 150, eNode-B 160a-c, MME 162, Serving Gateway 164, PDN Gateway 166, Base Station 180a-c, ASN Gateway 182, AAA 186, MIP-HA 184, and/or Gateway 188, or the like, may be performed by one or more emulation devices (not shown) (e.g., one or more devices configured to emulate one or more, or all, of the functions described herein).

[0067] The one or more emulation devices may be configured to perform the one or more, or all, functions in one or more modalities. For example, the one or more emulation devices may perform the one or more, or all, functions while being fully or partially implemented/deployed as part of a wired and/or wireless communication network. The one or more emulation devices may perform the one or more, or all, functions while being temporarily implemented/deployed as part of a wired and/or wireless communication network. The one or more emulation devices may perform the one or more, or all, functions while not being implemented/deployed as part of a wired and/or wireless communication network (e.g., such as in a testing scenario in a testing laboratory and/or a non-deployed (e.g. testing) wired and/or wireless communication network, and/or testing performed on one or more deployed components of a wired and/or wireless communication network). The one or more emulation devices may be test equipment.

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[0068] Below is a list of abbreviations and acronyms that may be used herein, by way of example and not limitation.

Δf	Sub-carrier spacing
5gFlex	5G Flexible Radio Access Technology
5gNB	5GFlex NodeB
ACK	Acknowledgement
BLER	Block Error Rate
BTI	Basic TI (in integer multiple of one or more symbol duration)
CB	Contention-Based (e.g. access, channel, resource)
CoMP	Coordinated Multi-Point transmission/reception
CP	Cyclic Prefix
CP-OFDM	Conventional OFDM (relying on cyclic prefix)
CQI	Channel Quality Indicator
CN	Core Network (e.g. LTE packet core)
CRC	Cyclic Redundancy Check
CSG	Closed Subscriber Group
CSI	Channel State Information
D2D	Device to Device transmissions (e.g. LTE Sidelink)
DCI	Downlink Control Information
DL	Downlink
DM-RS	Demodulation Reference Signal
DRB	Data Radio Bearer
EPC	Evolved Packet Core
FBMC	Filtered Band Multi-Carrier
FBMC/OQAM	A FBMC technique using Offset Quadrature Amplitude Modulation
FDD	Frequency Division Duplexing
FDM	Frequency Division Multiplexing
ICC	Industrial Control and Communications
ICIC	Inter-Cell Interference Cancellation
IP	Internet Protocol
LAA	License Assisted Access
LBT	Listen-Before-Talk
LCH	Logical Channel
LCP	Logical Channel Prioritization
LLC	Low Latency Communications
LTE	Long Term Evolution e.g. from 3GPP LTE R8 and up
MAC	Medium Access Control
NACK	Negative ACK
MC	MultiCarrier
MCS	Modulation and Coding Scheme
MIMO	Multiple Input Multiple Output
MTC	Machine-Type Communications
NAS	Non-Access Stratum
NR	New Radio access technology
NR-eNB	A network node that may e.g. schedule NR resources
OFDM	Orthogonal Frequency-Division Multiplexing
OOB	Out-Of-Band (emissions)
P_{cmax}	Total available UE power in a given TI
PHY	Physical Layer
PRACH	Physical Random Access Channel

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PDU	Protocol Data Unit
PER	Packet Error Rate
PLMN	Public Land Mobile Network
PLR	Packet Loss Rate
PSS	Primary Synchronization Signal
QoS	Quality of Service (from the physical layer perspective)
RAB	Radio Access Bearer
RACH	Random Access Channel (or procedure)
RAR	Random Access Response
RCU	Radio access network Central Unit
RF	Radio Front end
RNTI	Radio Network Temporary Identifier
RRC	Radio Resource Control
RRM	Radio Resource Management
RS	Reference Signal
RTT	Round-Trip Time
SCMA	Single Carrier Multiple Access
SDU	Service Data Unit
SI	System Information
SL	Sidelink
SOM	Spectrum Operation Mode
SS	Synchronization Signal
SSS	Secondary Synchronization Signal
SRB	Signaling Radio Bearer
SWG	Switching Gap (in a self-contained subframe)
TB	Transport Block
TBS	Transport Block Size
TDD	Time-Division Duplexing
TDM	Time-Division Multiplexing
TI	Time Interval (in integer multiple of one or more BTI)
TTI	Transmission Time Interval (in integer multiple of one or more TI)
TRP	Transmission / Reception Point
TRPG	Transmission / Reception Point Group
TRx	Transceiver
UFMC	Universal Filtered MultiCarrier
UF-OFDM	Universal Filtered OFDM
UL	Uplink
URC	Ultra-Reliable Communications
URLLC	Ultra-Reliable and Low Latency Communications
Uu	Interface between a NR-eNB/TRP (or equivalent) and a UE
V2V	Vehicle to vehicle communications
V2X	Vehicular communications
WLAN	Wireless Local Area Networks and related technologies (IEEE 802.xx domain)

[0069] Systems may manage (e.g., attempt to minimize) the impact of on-demand other-SI broadcast on an uninterested WTRU. Multi-stage RACH may be used for other-SI request. A WTRU may handle stored SI and/or may operate in a reduced MSI cell.

[0070] Terms New Radio (NR), 5gFLEX and 5G may be used interchangeably. While examples may refer to 3GPP protocols, subject matter described herein is applicable to other

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wireless systems (e.g., other wireless technologies, communication and/or control procedures). Terms and definitions do not limit the applicability of disclosed subject matter to other definitions, types of signals, configuration procedures and/or logical associations, e.g., between different user data units.

[0071] An air interface, e.g., for a new radio (NR) access technology in a 5G system, may support a variety of use cases, such as improved broadband performance (IBB), Industrial control and communications (ICC) and/or vehicular applications (V2X) and/or Massive Machine-Type Communications (mMTC). Use cases may have associated support in an air interface (e.g., 5G air interface).

[0072] An air interface may support, for example, ultra-low transmission latency (LLC), ultra-reliable transmission (URC) and/or machine-type communications (MTC) operation (including narrowband operation).

[0073] Support for ultra-low transmission latency (LLC) may comprise, for example, air interface latency such as 1ms RTT and/or TTIs between 100us to 250us. Support may be provided for ultra-low access latency (e.g., time from initial system access until the completion of the transmission of the first user plane data unit). End-to-end (e2e) latency less than 10ms may be supported, for example, for IC and/or V2X.

[0074] Support for ultra-reliable transmission (URC) may comprise, for example, improved transmission reliability, such as 99.999% transmission success and/or service availability. Support may be provided for mobility speed in the range of 0-500km/h. Packet Loss Ratio of less than $10e^{-6}$ may be supported, for example, for IC and/or V2X.

[0075] Support for MTC operation may comprise, for example, air interface support for narrowband operation (e.g. using less than 200 KHz), extended battery life (e.g., up to 15 years of autonomy) and/or minimal communication overhead for small and/or infrequent data transmissions (e.g., low data rate in the range of 1-100kbps with access latency of seconds to hours).

[0076] A 5gFLEX system may be implemented with OFDM and/or other waveforms for uplink and/or downlink. Description of examples herein is non-limiting. Examples are applicable and/or adaptable to other waveforms and wireless technologies.

[0077] OFDM may be used as a signal format for data transmissions, e.g., in LTE and IEEE 802.11. OFDM may efficiently divide spectrum into multiple parallel orthogonal subbands. A (e.g., one or more, or each) subcarrier may be shaped using a rectangular window in the time domain, which may lead to sinc-shaped subcarriers in the frequency domain. OFDMA may rely on (e.g., perfect) frequency synchronization and/or tight management of uplink timing alignment

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within the duration of the cyclic prefix, for example, to maintain orthogonality between signals and/or to minimize intercarrier interference. Tight synchronization may be difficult, for example, in a system where a WTRU may be simultaneously connected to one or more, or multiple access points. Additional power reduction may be applied to uplink transmissions, for example, to comply with spectral emission requirements for adjacent bands. Fragmented spectrum may be aggregated for WTRU transmissions.

[0078] OFDM (CP-OFDM) performance may be improved, for example, by more stringent RF requirements for implementations, such as operation using a large amount of contiguous spectrum that might not require aggregation. A CP-based OFDM transmission scheme may provide a downlink physical layer for 5G similar to a 4G system with modifications to pilot signal density and/or location.

[0079] 5gFLEX radio access may be characterized by a very high degree of spectrum flexibility that enables deployment in different frequency bands with different characteristics, which may include different duplex arrangements, different and/or variable sizes of available spectrum, such as contiguous and/or non-contiguous spectrum allocations in the same or different bands. 5gFLEX radio access may support variable timing aspects, such as support for one or more, or multiple TTI lengths and/or asynchronous transmissions.

[0080] Multiple duplexing schemes (e.g., TDD, FDD) may be supported. Supplemental downlink operation may be supported, e.g., for FDD operation, for example, using spectrum aggregation. FDD operation may support full-duplex FDD and/or half-duplex FDD operation. DL/UL allocation may be dynamic (e.g., might not be based on a fixed DL/UL frame configuration), e.g., for TDD operation. The length of a DL and/or a UL transmission interval may be set per transmission opportunity.

[0081] A 5G air interface characteristic and/or capability may enable different transmission bandwidths on uplink and/or downlink ranging, e.g., varying between a nominal system bandwidth to a maximum value corresponding to the system bandwidth.

[0082] Single carrier operation may support a variety and/or range of system bandwidths, such as 5, 10, 20, 40, and/or 80 MHz, and/or 160MHz. Nominal bandwidths may have one or more fixed values. Narrowband transmissions (e.g., 0 to 200 KHz) may be supported within the operating bandwidth for MTC devices.

[0083] System bandwidth may refer to the largest portion of spectrum that may be managed by a network for a given carrier. The spectral portion of a carrier that a WTRU minimally supports for cell acquisition, measurements and/or initial access to the network may correspond to the nominal system bandwidth. A WTRU may be configured with a channel bandwidth that

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may be within the range of the entire system bandwidth. A WTRU's configured channel bandwidth may or might not include a nominal part of system bandwidth, e.g., as shown in the example in FIG. 2.

[0084] FIG. 2 is an example of transmission bandwidths. Bandwidth flexibility may be achieved, for example, because (e.g., all) applicable sets of RF requirements for a given maximum operating bandwidth in a band may be met without the introduction of additional allowed channel bandwidths for that operating band, e.g., due to the efficient support of baseband filtering of the frequency domain waveform.

[0085] A WTRU's channel bandwidth for single carrier operation may be configured, reconfigured and/or dynamically changed. Spectrum for narrowband transmissions within the nominal system, system and/or configured channel bandwidth may be allocated.

[0086] A 5G air interface physical layer may be band-agnostic and/or may support operation in licensed bands (e.g., below 5 GHz) and/or unlicensed bands (e.g., in the range 5-6 GHz). Listen before talk (LBT) Cat 4 based channel access framework similar to LTE LAA may be supported, e.g., for operation in unlicensed bands.

[0087] Cell-specific and/or WTRU-specific channel bandwidths for arbitrary spectrum block sizes may be scaled and/or managed (e.g., scheduling, addressing of resources, broadcasted signals, measurements, etc.).

[0088] Downlink control channels and signals may support FDM operation. A WTRU may acquire a downlink carrier, for example, by receiving transmissions using (e.g., only) the nominal part of the system bandwidth. For example, a WTRU might not initially receive transmissions covering the entire bandwidth being managed by the network for the concerned carrier.

[0089] Downlink data channels may be allocated over a bandwidth that may or might not correspond to nominal system bandwidth, e.g., without restrictions other than being within a WTRU's configured channel bandwidth. For example, a network may operate a carrier with a 12 MHz system bandwidth using a 5MHz nominal bandwidth allowing devices supporting 5 MHz maximum RF bandwidth to acquire and/or access the system while potentially allocating +10 to -10 MHz of the carrier frequency to other WTRU's supporting up to 20 MHz worth of channel bandwidth.

[0090] FIG. 3 is an example of flexible spectrum allocation. FIG. 3 shows an example of spectrum allocation where different subcarriers may be (e.g., at least conceptually) assigned to different modes of operation (hereafter Spectrum Operation Mode or SOM). Different SOM may be used to fulfill different requirements for different transmissions. A SOM may include

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and/or be defined based on one or more of a subcarrier spacing, a TTI length and/or one or more reliability aspects (e.g., HARQ processing aspects, secondary control channel). A SOM may be used to refer to a (e.g., specific) waveform and/or may be related to a processing aspect (e.g., in support of co-existence of different waveforms in the same carrier using FDM and/or TDM and/or coexistence of FDD operation in a TDD band (e.g. with support in a TDM manner or similar)).

[0091] A WTRU may be configured to perform transmissions according to one or more SOMs. For example, a SOM may correspond to transmissions that use at least one of the following: a specific TTI duration, a specific initial power level, a specific HARQ processing type, a specific upper bound for successful HARQ reception/transmission, a specific transmission mode, a specific physical channel (uplink and/or downlink), a specific waveform type and/or even a transmission according to a specific RAT (e.g., LTE and/or according to a 5G transmission technique). A SOM may correspond to a QoS level and/or a related aspect (e.g., maximum/target latency, maximum/target BLER or similar). A SOM may correspond to a spectrum area and/or to a specific control channel and/or aspect thereof (e.g., search space and/or DCI type). For example, a WTRU may be configured with a SOM for a URC type of service, a LLC type of service and/or an MBB type of service. A WTRU may have a configuration for a SOM for system access and/or for transmission/reception of L3 control signaling (e.g., RRC), for example, in a portion of a spectrum associated with a system, such as in a nominal system bandwidth.

[0092] Spectrum aggregation may be supported (e.g., for single carrier operation). A WTRU may support transmission and/or reception of one or more, or multiple transport blocks over contiguous and/or non-contiguous sets of physical resource blocks (PRBs), e.g., within the same operating band. Mapping of a single transport block to separate sets of PRBs may be supported. Support may be provided for simultaneous transmissions associated with different SOM requirements.

[0093] Multicarrier operation may be supported, for example, using contiguous and/or non-contiguous spectrum blocks within the same operating band and/or across two or more operating bands. Support may be provided for aggregation of spectrum blocks using different modes (e.g., FDD and/or TDD) and/or different channel access procedures (e.g., licensed and/or unlicensed band operation below 6 GHz). Support may be provided for procedures that configure, reconfigure and/or dynamically change a WTRU's multicarrier aggregation.

[0094] A scheduling function may be supported in the MAC layer. Support may be provided for one or more, or multiple (e.g., two) scheduling modes, e.g., network-based scheduling (e.g.,

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for tight scheduling in terms of resources, timing and/or transmission parameters of downlink transmissions, and/or uplink transmissions) and/or WTRU-based scheduling (e.g., for more flexibility in terms of timing and/or transmission parameters). Scheduling information for modes may be valid for one or more TTIs.

[0095] Network-based scheduling may enable a network to tightly manage available radio resources assigned to different WTRUs, which may permit optimal sharing of resources. Dynamic scheduling may be supported.

[0096] WTRU-based scheduling may enable a WTRU to opportunistically access uplink resources with minimal latency on a per-use basis, for example, within a set of shared and/or dedicated uplink resources assigned (e.g., statically and/or dynamically) by the network. Support may be provided for synchronized and/or unsynchronized opportunistic transmissions. Support may be provided for contention-based transmissions and/or contention-free transmissions.

[0097] Support for opportunistic transmissions (scheduled and/or unscheduled) may be provided, for example, to meet ultra-low latency requirements for 5G and/or power saving requirements for mMTC.

[0098] A WTRU may be configured to receive and/or detect one or more system signatures. A system signature may consist of a signal structure using a sequence. A signal may be similar to a synchronization signal, e.g., similar to LTE PSS and/or SSS. A signature may be specific to (e.g., may uniquely identify) a particular node (and/or transmission/reception point (TRP)) within a given area and/or it may be common to a plurality of nodes (and/or TRPs) within an area, which aspect might not be known and/or relevant to a WTRU. A WTRU may determine and/or detect a system signature sequence. A WTRU may determine one or more parameters associated with the system. For example, a WTRU may further derive an index therefrom and/or may use the index to retrieve associated parameters, e.g., within a table, such as an access table. For example, a WTRU may use received power associated with a signature for open-loop power control, e.g., to set an initial transmission power when a WTRU determines that it may access (and/or transmit) using applicable resources of the system. For example, a WTRU may use the timing of a received signature sequence, e.g., to set the timing of a transmission (e.g., a preamble on a PRACH resource) when the WTRU determines that it may access (and/or transmit) using applicable resources of the system.

[0099] A system signature may consist of any type of signal received by a WTRU for one or more purposes described herein.

[0100] A WTRU may be configured with a list of one or more entries. A list may be referred to as an access table. A list may be indexed, e.g., where an (e.g., one or more, or each) entry

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may be associated with a system signature and/or to a sequence thereof. An access table may provide initial access parameters for one or more areas. An (e.g., one or more, or each) entry may provide one or more parameters necessary for performing an initial access to the system. Parameters may include one or more of a set of one or more random access parameters (e.g., including applicable physical layer resources, such as PRACH resources) in time and/or frequency, initial power level and/or physical layer resources for reception of a response. Parameters may (e.g., further) include access restrictions (e.g., PLMN identity and/or CSG information). Parameters may (e.g., further) include routing-related information, such as one or more applicable routing areas. An entry may be associated with (and/or indexed by) a system signature. Such entry may be common to a plurality of nodes (and/or TRPs), for example. A WTRU may receive an access table, for example, via a transmission using dedicated resources (e.g., by RRC configuration) and/or by a transmission using broadcast resources. In the latter case, the periodicity of the transmission of an access table may be relatively long (e.g., up to 10240ms), which may be longer than the periodicity of the transmission of a signature (e.g., in the range of 100ms).

[0101] An access table may consist of any type of system information received by a WTRU for one or more purposes described herein.

[0102] 5gFLEX may support one or more forms of association between data available for transmission and/or available resources for uplink transmissions. Multiplexing of data with different QoS requirements within the same transport block may be supported, for example, when multiplexing does not introduce a negative impact to the service with the most stringent QoS requirement and/or does not introduce an unnecessary waste of system resources.

[0103] A Logical Channel (LCH) may represent a logical association between data packets and/or PDUs. An association may be based on data units being associated with the same bearer (similar to legacy), and/or being associated with the same SOM and/or slice (e.g., a processing path using a set of physical resources). For example, an association may be characterized by one or more of a chaining of processing functions, an applicable physical data (and/or control) channel (and/or instance thereof) and/or an instantiation of a protocol stack with one or more of: a specific portion being centralized (e.g., PDCP and/or anything beyond portions of the physical layer processing such as Radio Front (RF) end); and/or another portion being closer to the edge (e.g. MAC/PHY in the TRP and/or RF) potentially separated by a fronthauling interface. The term LCH as used herein may have a different and/or broader meaning than a similar term for LTE systems.

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[0104] A WTRU may be configured to determine a relationship between different data units. A relationship may be based on a matching function (e.g., based on the configuration of one or more field values common to data units that are part of the same logical association). Fields may correspond to fields in a protocol header associated with the data unit(s). For example, a matching function may use a tuple of parameters for fields of the IP headers of a data unit, such as IP source/destination address(es), transport protocol source/destination port(s) and/or transport protocol type, IP protocol version (e.g., IPv4 and/or IPv6), etc.

[0105] For example, data units that are part of the same logical association may share a common radio bearer, processing function, SOM and/or may (e.g., at least conceptually) correspond to the same LCH and/or LCG.

[0106] A Logical Channel Group (LCG) may consist of a group of LCH(s) (and/or equivalent as per the definition above), e.g., where a grouping may be based on one or more criteria. Criteria may be, for example, that one or more LCH(s) may have a similar priority level applicable to one or more, or all LCHs of the same LCG and/or may be associated with the same SOM (and/or type thereof), the same slice (and/or type thereof). For example, an association may characterized by one or more of a chaining of processing functions, an applicable physical data (and/or control) channel (and/or instance thereof) and/or instantiation of a protocol stack, which may include one or more of: a specific portion being centralized (e.g., PDCP and/or anything except RF); and/or another portion being closer to the edge (e.g., MAC/PHY in the TRP and/or RF) that may be separated by a fronthauling interface. The term LCG as used herein may have a different and/or broader meaning than a similar term for LTE systems.

[0107] A radio access network (RAN) slice may include (e.g. one or more, or all) radio access network functions and/or transport network functions and/or resources, e.g., radio resources and/or backhaul/fronthaul resources along with core network functions/resources that may be used and/or required to provide end-to-end services to a user. Network functions may, for example, be virtualized on a general purpose processor, run as network functions on specialized hardware and/or split between specialized hardware and general purpose hardware. A PLMN may consist of one or more network slices. A slice may be equivalent to an operator's single, common and/or general purpose network. A RAN slice may consist of one or more SOMs that may be optimized to support various services that the RAN slice may have to offer.

[0108] For example, WTRUs served within a slice may have, for example, one or more of the following aspects in common: services and/or QoE requirements (e.g. ULLRC, eMBB, MMTC); WTRU categories (e.g., CAT 0 to M and beyond, additional categories may be defined for >6GHz to differentiate beamforming capability); coverage requirements (e.g., normal

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coverage, enhanced coverage); PLMN/Operators; support for specific Uu interface (e.g., LTE, LTE-Evo, 5G below 6Ghz, 5G above 6Ghz, Unlicensed); and/or served by same core network slice. The terms "RAN slice" and "slice" may be used interchangeably.

[0109] A Transport Channel (TrCH) may include one or more sets (e.g., a specific set) of processing steps and/or a specific set of functions applied to data information that may affect one or more transmission characteristics over a radio interface.

[0110] LTE may define one or more, or multiple types of TrCH, such as the Broadcast Channel (BCH), the Paging Channel (PCH), the Downlink Shared Channel (DL-SCH), the Multicast Channel (MCH), the Uplink Shared Channel (UL-SCH) and/or the Random Access Channel (which might not carry user plane data). Transport channels for carrying user plane data may include the DL-SCH and/or the UL-SCH for the downlink and for the uplink, respectively.

[0111] An augmented set of requirements may be supported by an air interface for a 5G system. Support may be provided for one or more, or multiple transport channels, e.g., for user and/or control plane data, for one or more WTRU devices. The term TrCH as used herein may have a different and/or broader meaning than a similar term for LTE systems. For example, a transport channel for URLLC (e.g., URLLCH), for mobile broadband (MBBCH) and/or for machine type communications (MTCCH) may be defined for downlink transmission (e.g., DL-URLLCH, DL-MBBCH and/or DL-MTCCH) and/or for uplink transmissions (e.g., UL-URLLCH, UL-MBBCH and/or UL-MTCCH).

[0112] For example, one or more, or multiple TrCH may be mapped to a different set of physical resources (e.g., PhCH) belonging to the same SOM. This may be advantageous, for example, to support simultaneous transmission of traffic with different requirements over the same SOM. An example of this may be transmitting a URLLCH along MTCCH simultaneously when a WTRU is configured with a single SOM.

[0113] A WTRU may be configured with one or more parameters associated with a characterization of how data should be transmitted. A characterization may represent constraints and/or requirements that a WTRU may be expected to meet and/or enforce. A WTRU may perform different operations and/or adjust its behavior as a function of the state associated with the data based on a characterization. Parameters may include, for example, time-related aspects (e.g., Time to Live (TTL) - for a packet, which represents the time before which the packet should be transmitted to meet, acknowledged, etc. to meet latency requirements), rate-related aspects and/or configuration related aspects (e.g., absolute priority). Parameters may (e.g., also) be changed with time while a packet and/or data may be pending for transmission.

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[0114] A WTRU may be connected to TRPs, e.g., in standalone mode and/or assisted mode. A group of cells that requires assistance may be referred to as an assisted layer. A group of cells that provides the assistance may be referred to as an assistance layer.

[0115] FIG. 4 is an example of different types of assistance layers, using example WTRUs 401-408. Examples of assistance modes may include, for example one or more of: a WTRU 401 connected to 5Gflex small cell in below-6Ghz band assisted by 5Gflex macro cell in sub-6Ghz band; a WTRU 402 connected to 5Gflex small cell in below-6Ghz band assisted by LTE-Evo macro cell; a WTRU 403 connected to 5Gflex small cell in above-6Ghz band assisted by 5Gflex macro cell in sub-6Ghz band; a WTRU 404 connected to 5Gflex small cell in above-6Ghz band assisted by LTE-Evo macro cell; a WTRU 405 connected to 5Gflex small cell in above-6Ghz band assisted by 5Gflex small cell in below-6Ghz band; a WTRU 407 connected to 5Gflex small cell in below-6Ghz band in standalone mode; a WTRU 406 connected to 5Gflex macro cell in above-6Ghz band in standalone mode and/or a WTRU 408 connected to 5Gflex small cell in above-6Ghz band in standalone mode.

[0116] Deployment scenarios may be supported by one or more procedures described herein. For example, a deployment scenario may be LTE-assisted 5gFLEX Aggregation (DC/CA/Offload). A WTRU may be configured, for example, using an LTE Control Plane (e.g., with an LTE RRC connection) using an LTE User Plane (e.g., with one or more LTE Uu interfaces). A WTRU may be (e.g., further) configured (e.g., by reception of access table(s) from broadcast and/or dedicated signaling) to operate with one or more additional 5gFLEX Uu(s), for example, using the principles of LTE DC, LTE CA and/or LTE-WLAN offload.

[0117] An example of a deployment scenario may be LTE-assisted 5gFLEX Transport Channel(s) (LTE CP, LTE UP, LTE Uu with one or more 5gFLEX TrCH/Physical channels plugged into LTE Uu). A WTRU may be configured for LTE Uu operation (e.g., using LTE procedure(s)). A WTRU may be (e.g., further) configured with one or more physical layer (e.g. control and/or data) channels for a 5gFLEX Uu of the WTRU's configuration. Downlink (DL) physical channels may co-exist in the DL carrier and/or frequency band. An uplink (UL) carrier may (e.g., also) be common or separate. Cell-specific LTE signals/channels may be viewed as "holes" in the 5gFLEX map of physical layer resources, for example, from the perspective of a WTRU configured with one or more 5gFLEX physical channels.

[0118] An example of a deployment scenario may be LTE-based Stand-alone 5gFLEX operation (LTE CP, LTE L2 at least in part, 5gFLEX PHY). A WTRU may be configured with one or more (e.g., many, most or one or more, or all) of the components of an LTE control plane (e.g., RRC connection, security, etc.) and/or the LTE user plane (e.g., EPS RABs, PDCP, RLC).

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A WTRU may be (e.g., further) configured with one or more 5G MAC instance(s). An (e.g., one or more, or each) instance may have one or more 5gFLEX Uu(s). Stated somewhat differently, for example, a WTRU might not be configured with an LTE PCell.

[0119] For example, a deployment scenario may be Stand-alone 5gFLEX operation. A WTRU may be configured with a 5G control plane and/or a 5G user plane. 5gFLEX Uu operation may be supported.

[0120] WTRU states may be modeled. The terms "state" and "mode" may be used interchangeably. Aspects of this disclosure may be applicable independent of state. Some aspects may be applicable for more than one state. Some aspects described herein may be applicable whether or not such states are actually defined.

[0121] A WTRU may operate according to at least one of the following states and/or similar: idle mode, light connected/loosely connected/inactive mode, and/or connected, fully connected/active mode.

[0122] In WTRU idle mode, from the network's perspective, the WTRU might not have a context with the radio access network ("RAN"). For example, in a distributed architecture, a WTRU might not have context at the edge control function and/or the central control function. From the WTRU's perspective in idle mode, the WTRU may monitor paging from the core network (e.g., at a well-defined DRX cycle). The WTRU may perform measurements and/or autonomous mobility. The WTRU may acquire, store, and/or apply system information valid for at least idle mode operations.

[0123] In WTRU light connected/loosely connected/inactive mode, from the network's perspective, there may exist a WTRU context stored in the RAN. There may also exist a RAN-core connection for the WTRU. For example, in a distributed architecture, a WTRU may have context established at the central control function with limited and/or no context at the edge control function. The WTRU may be tracked (e.g., at a granularity of a logical area greater than or equal to a cell). The WTRU may be reached by the RAN via paging messages that originates in the RAN (e.g., at DRX cycles specific to the light connected state). From the WTRU's perspective, a WTRU might not have an active and/or established connection to the RAN. Mobility in light connected state may be WTRU controlled. A WTRU may move within a logical area without notifying the network. A WTRU may notify the network when the WTRU determines that the WTRU has moved outside a logical area (e.g., the WTRU would fail to detect the signature/reference signal and/or another property that identifies the concerned area) and/or across a boundary between two different logical areas (e.g., the WTRU would detect a

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different identity for the current area). Mobility in light connected state may also be network controlled (e.g., to enable handover when data transfer is allowed and/or ongoing).

[0124] In the connected/fully connected/active mode, from the network's perspective, the WTRU may have connectivity with the network (e.g., the WTRU context may be established at the radio access network, and/or WTRU specific connection may be established between RAN and core network). For example, in a distributed architecture, a WTRU may have context established at a central control function and/or one or more edge control functions. A WTRU may have at least one user plane function/component established. WTRU mobility may be tracked at the cell level and/or may be WTRU assisted, network controlled mobility. Network configured WTRU controlled mobility may be used.

[0125] The states described may represent a standalone/independent state, with transition logic in between. Some of the states may have relationships to each other. For example, some states may be functional elements of another state (e.g., where transition between sub-states might not imply significantly different RRC function and/or trigger RRC behavior). For example, a connectionless transfer may be a sub-state and/or an access method for a WTRU in idle or light connected state. In another example, the light connected state may be a RAN controlled state.

[0126] WTRU control aspects may include procedures enabling configuration and/or coherent operation for one or more of the following aspects: a plurality of radio "layers"; a plurality of radio access technologies (e.g., NR, LTE, Wifi, etc.); a plurality of L2 transport and/or user plane components, which may be realized using different network slices and/or sets of physical resources; and/or enhanced connectivity principles such as loosely connected state.

[0127] In the broadcast transmission of on-demand other-SI, the notification of presence of other-SI and/or scheduling indication of other-SI may trigger a reception procedure (e.g., unnecessary) for the WTRUs that are uninterested in the other-SI. Trigger reception procedures in uninterested WTRU's may be energy inefficient.

[0128] Although examples describe procedures, features and elements in particular combinations, the disclosed subject matter encompasses implementation of one or more, or each procedure, feature and/or element in whole or in part, individually or in any combination with and without other procedures, features and/or elements disclosed herein or known.

[0129] A transmission/reception point (TRP) may support, for example, one or more of the following access procedures: LTE/LTE-A/LTE-Evo air interface, an NR access (e.g. based on a flexible 5G air interface and/or similar), a beamformed interface for higher frequencies, a non-3GPP access (e.g. 802.11 family such as WiFi), License Assisted Access (LAA), a narrow band

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air interface and/or similar. TRP, eNB/NR-eNB, access point, base station and/or the like may be used interchangeably.

[0130] A WTRU may be connected in a number of different manners with a radio system. For example, a WTRU may be configured for transmission to/from one or more TRPs. One or more, or multiple transmissions may be transmitted and/or received concurrently. A WTRU may (e.g. further) be configured for transmissions that may be characterized by varying levels of diversity/reliability, mobility robustness, differentiation in terms of services, etc. Higher level services may involve, for example, the configuration of a plurality of TRPs to achieve service levels. For example, one or more TRPs may support (e.g. only) narrow band transmissions, one or more TRPs may provide best effort offload, one or more TRPs may provide less overhead (e.g. specific signatures, preconfigured bearer), etc. A WTRU may be agnostic to the identity of a TRP and/or the number of TRPs, for example, even when configured with one or more, or multiple TRPs. For example, transmissions to/from different TRPs may be differentiated, for example, based on applicable reference signals (RS), control channels, timing and/or operating carrier/frequencies.

[0131] A distributed approach may be implemented for control plane modeling. A control plane in previous generations of wireless systems (e.g. LTE) may have a suite of protocols (e.g. RRC and/or NAS) use a very centralized and/or monolithic approach, e.g., from a WTRU perspective. A centralized approach may be difficult to scale for next generation systems that may require support for and/or coordination between differentiated services (e.g. very low latency services), multi-connectivity, a larger number of small cells for a given WTRU.

[0132] Distribution of (e.g. certain) functions, for example, towards the edge of a RAN (e.g. in or close to a TRP) may provide a more scalable approach for an NR system. Furthermore, increased isolation between different user plane processing paths (e.g. similar to bearers in EPC/LTE) may facilitate differentiated QoS, management of multi-path bearers (and/or similar) as well as differentiated allocation of network resources in a system and/or (e.g. potentially) sharing of network resources between operators.

[0133] Example procedures disclosed herein may enable a WTRU to be configured with plurality of user plane functions and/or processing paths according to diverse service requirements with support for diverse device types, deployment scenarios and/or other requirements in an NR system. For example, procedures disclosed herein may enable a control plane entity to establish, maintain and/or tear down service specific user plane components as useful, e.g., using a distributed model.

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[0134] A separation and protocol/functional split may be provided. A distributed control plane may be modeled, for example, to enable a number of control functions to operate close to the edge of the system. The functions may be replicated, for example, using a number of instances (e.g. in different TRPs with multi-connectivity). Some functions may be centralized (e.g. to manage core network connectivity and/or user plane instances). Consequently, there may be one or more, or multiple different termination points in the access network that concurrently provide control services for a given WTRU. A WTRU may support a multiplexing/demultiplexing function (e.g. different sets of one or more SRBs) associated with one or more (e.g. specific) control plane contexts/instances/functions and/or a set thereof. A control plane model may (e.g. also) support one or more control plane functions to operate concurrently and/or in parallel, e.g., for functions logically closer to the edge. Centralizing one or more control plane functions may enable and/or facilitate coordination between different control plane instances of the same WTRUs, e.g., coordination between different TRPs of a WTRU's configuration.

[0135] Control plane/user plane (CP/UP) separation may be modeled in a variety of different ways. There may be a variety of potential axes for separation of the different components of a control plane.

[0136] For example, vertical isolation may be provided in a protocol stack (CP and/or UP). Different options may be based on depth of separation. For example, in a partial separation and/or split approach, CP/UP specific higher layers may be followed by one or more common lower layers. For example, in a complete separation, an independent protocol stack may be provided, e.g., all the way down to L1/PHY. For example, an optimized PHY channel design and/or different DCI/grant level may be provided. A different Spectral Operating Mode/signal structure may be provided.

[0137] For example, horizontal separation may be provided between instances of a (e.g. potentially different) protocol stack. A control plane instance may operate on a user plane instance. A protocol stack may be separated, e.g., by an interface between a central unit (CU) and a remote unit (RU). Functional splits may be based on one or more of the following, for example: transport network profile (e.g. fronthaul and/or backhaul bandwidth, latency, jitter, etc.); specific deployment scenarios; type of service (e.g. eMBB services may utilize centralized processing for cost savings and/or URLLC services may utilize distributed processing to minimize latency); resource availability (e.g. processing resource, specialized hardware); vendor interoperability; and/or dynamic changes to transport network capacity (e.g. when the transport network is shared with one or more, or multiple TRPs and/or operators).

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[0138] For example, physical and/or access separation may be provided. Uu termination may be provided for control and/or user plane at different nodes in the RAN (e.g. assisted layer and/or different TRP). For example, CP termination may be at LTE-Evo eNB and/or UP termination may be at NG TRP/RCU, e.g., in assisted mode. For example, an L2 transport and/or termination point for CP may be different from UP, e.g., in standalone mode. For example, an L2 transport and/or termination point for CP may be any TRP while for UP it may be using a restricted set of TRPs, e.g., in standalone mode.

[0139] Modeling described herein may support any of the foregoing separation models and/or other models, alone or in combination. For example, modeling may facilitate having a control plane component and its associated user plane in different RAN slices. Slices may be realized, for example, by physical and/or vertical separation. For example, a multi-plane architecture may support a combination of horizontal separation and/or vertical isolation.

[0140] Examples of elements and/or characteristics may be provided for a distributed control plane architecture.

[0141] A high level generalization (e.g. a conceptual view) of a control plane may be as a set of one or more control function(s). A control function may include processing actions and/or related parameters. Examples of control functions are described herein. A control function may apply to one or more component(s) of a WTRU.

[0142] Components may include, for example, a protocol (e.g. NAS, RRC, PDCP, RLC, MAC, PHY, etc.) and/or a corresponding entity, an implementation aspect (e.g. a power control function, a state of a WTRU, etc.), a set of resources (e.g. a data transport path, a bearer, etc.) and/or a combination thereof (e.g. a set of physical/processing resources, a slice, etc.). Examples of component combinations are described herein.

[0143] A control functions may be characterized as being applicable, for example, according to one or more of the following: a WTRU-specific function; a component-specific function; and/or a plural-component function.

[0144] A WTRU-specific function, for example, such as a control function may be applicable to any aspect(s) and/or component(s) of a WTRU. For example, a function that controls a WTRU's connectivity to a core network (e.g. in terms of access credentials) may be WTRU-specific. A function may (e.g. from a network perspective) be centralized in a node that supports connectivity to a plurality of TRPs/NR-eNBs. For example, a function may be logically part of a RAN Central Control Function (RCCF), e.g., described below.

[0145] A component-specific function, for example, such as a control function may be applicable to one or more aspects of a WTRU. An aspect may be, for example: a MAC instance;

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a signature-specific aspect (e.g. a configuration corresponding to a signature); a TRP-specific aspect (e.g. a configuration corresponding to a TRP; a TRPG-specific aspect (e.g. a configuration corresponding to a TRPG); an LCH (and/or equivalent)-specific aspect (e.g. a configuration corresponding to an LCH); an instance of a component combination (e.g. a bearer, a flow such as a sequence of packets identified by a matching rule (e.g. a tuple, etc.), for example, as described herein; a slice specific aspect (e.g. a configuration) corresponding to a RAN slice and/or a core network slice and/or to an end-to-end network slice (e.g. a core network slice, a slice selection function and/or one or more RAN functions); a spectral operating mode (e.g. a configuration) corresponding to a spectral operating mode, and/or other examples. For example, a WTRU may apply a received configuration to a specific time/frequency resource while using a different configuration for other time/frequency resources in the system.

[0146] For example, a function may be logically part of an Access Control Function (ACF), e.g., for a function dedicated to connectivity to a single TRP/NR-eNB, which may include configuration for a MAC instance and/or physical layer parameters (e.g. single or multiple cells/carriers) for a given WTRU.

[0147] In a plural-component function, for example a control function may be applicable to a plurality of components of a WTRU. For example, a function may be logically part of an Access Control Function (ACF) for a function that may control connectivity for a TRPG and/or for one or more NR-eNB(s), which may include configuration for a single MAC instance (e.g. COMP) and/or for one or more, or multiple MAC instances (e.g. for multi-connectivity) and/or (e.g. required) physical layer parameters for a given WTRU. This may, for example, further include coordination and/or configuration aspects for a WTRU to handle, e.g., with reception of one or more, or multiple responses to a random access within a TRPG, if applicable, for single TRP selection and/or for multiple TRP selection (e.g. for aggregation and/or multiple connectivity).

[0148] Examples may be provided for some (e.g. most) applicable control plane functions, e.g., individually. A function may be described with reference to its applicability to these non-limiting characterizations.

[0149] High-level modeling of a control plane for NR may be provided. Functions and/or components may, for example, be logically grouped.

[0150] A multi-plane architecture may be provided. For example, functions and/or components supporting an NR system may be logically grouped, for example, in terms of an Access Plane (AP), a Central Control Plane (CCP) and/or a Central User Plane (CUP). A description of example realizations of user plane components is described herein.

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[0151] Logical grouping of functions may enable different components and/or functions of a system to be isolated from each other. Isolation may (e.g. further) enable components and/or functions to be controlled, configured, modified and/or operated separately from each other. Separation may be applied for components and/or functions associated with a specific WTRU, per TRP/NR-eNB, per TRPG, per TRPGs, per group of NR-eNBs, per LCH (and/or equivalent), per slice, etc. Separation between centralized and access-related grouping may enable coordination between different instances of a function (e.g. system information provisioning, bearer configuration and/or equivalent) and/or between different instances of different functions (e.g. core network connectivity and/or user plane/bearer instances).

[0152] FIG. 5 is an example of logical grouping. There may be an architectural aspect and/or approach to a functional split. For example, FIG. 5 shows an example of a tri-plane architecture.

[0153] Different principles for a functional split between an access control plane and a central control plane may be considered.

[0154] For example, there may be a single access plane per RAT and/or central control per one or more, or multiple RATs. For example, an access control plane may include control functions specific to the access technology (e.g. beamforming control function, control function specific to LTE, non-3GPP control function, etc.). A central control plane may include control functions that are agonistic to an air interface. A common central control plane may be associated with one or more, or multiple TRPs with diverse access technologies, for example, for LTE/LTE-A/LTE-Evo air interface, a flexible 5G air interface, a beamformed air interface for higher frequencies, a non-3GPP access (e.g. 802.11 family such as WiFi), License assisted access (LAA), a narrow band air interface, etc.

[0155] For example, there may be one access plane per TRP/cell and/or central control per one or more, or multiple TRPs. For example, an access control plane may include control functions specific to a TRP/cell. A central control plane may include control functions applicable to more than one TRP. This approach may simplify inter-TRP coordination for efficient radio resource management, RAN mobility management and/or self-organizing functions, etc. A central control plane may (e.g. in one or more cases) lead to cost effective deployments, for example, as it might not require additional interface between TRPs.

[0156] For example, an access control plane may be responsible for establishment, maintenance and/or release of a layer 1/layer 2 (L1/2) connection, allocation of a temporary identifier to identify a WTRU uniquely within a TRP, common and/or dedicated L1 and/or L2 resource configuration specific to a TRP, etc. A central control plane may be responsible for

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configuring L3 signaling flows and/or abstraction thereof (e.g. signaling radio bearers), configuration of higher layer data flows and/or abstraction thereof (e.g. data radio bearers), security functions (e.g. may include key management), radio resource configuration (e.g. may be common across two or more TRPs), mobility functions (e.g. may include WTRU measurement control), handover control, context transfer, paging, etc.

[0157] QoS management functions may be controlled by a central control plane and/or may be enforced by an access control plane. QoS management functions may be part of a user plane control function, if applicable.

[0158] A system information broadcast function may be shared between an access control plane and a central control plane. For example, an access control plane may be responsible for scheduling and/or transmission of TRP specific system information related to accessibility, physical channel configuration, SC-PTM configuration, etc. An access control plane may be responsible for transmission of MIB and/or for handling dedicated system information procedure.

[0159] A central control plane may, for example, determine the contents of system information for cell (re)-selection information, intra-frequency, inter-frequency and/or inter-RAT neighbor information, MBMS information, side link information etc. Common and/or shared channel related configuration may be coordinated between the access control plane and central control plane. For example, a configuration for layer 2 RAN functions located in TRPs may be configured and/or controlled by the access control plane (e.g. for MAC, physical layer) while layer 2 RAN functions placed in the central user plane entity may be configured and/or controlled by the central control plane (e.g. for PDCP, RLC, bearers and/or similar and/or access table for a TRPG, if applicable).

[0160] A service/QoS-based functional location may be provided for a function in an access plane and/or a control plane. For example, control functions that may be time sensitive with a strict deadline may be placed in TRPs while other control functions may be placed in the central control plane. This approach may relax latency requirements on the fronthaul interface between the central unit and the TRPs and/or may enable cost efficient deployments.

[0161] Another example of a functional split may be applied, for example, when RAN level slicing is supported. For example, control functions that are common across two or more slices may be placed in the central control plane while control functions that are specific to a slice may be placed in the access control plane. In this approach, mobility control, WTRU context handling, etc. may be a part of a central control plane while the access control plane may include

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slice specific system information broadcast, slice specific authentication and/or security management, and/or slice specific QoS enforcement, etc.

[0162] A WTRU may be able to determine how to exchange signaling with different endpoints and/or with specific instances of a function, for example, based on these modeling examples. Such may be realized using different multiplexing procedures such as those described herein.

[0163] Access control functions (e.g. from the perspective of an overall RAN architecture) may be (e.g. conceptually) defined as set of logical functions, parameters and/or procedures that enable a WTRU to be uniquely addressed and/or identified by one or more TRPs. A WTRU may (e.g. further) generate and/or exchange data and/or signaling with those TRPs. Access control functions may provide distributed/edge control and/or user plane functions that may be specific to a TRP and WTRU pair. An (e.g. one or more, or each) access control function may be associated with a scheduler instance controlling one or more TRPs (e.g. over ideal backhaul). Such function may be part of a radio resource control protocol (e.g. RRC). Such function may be performed by a RRC entity e.g. located in a TRP. A WTRU may (e.g. from the WTRU perspective) be configured to associate a specific signaling bearer and/or equivalent (e.g. a transport path/procedure) for control of a MAC entity with the concerned MAC entity. The function may be part of a Medium Access Control (e.g. MAC) protocol. This function may be performed by a MAC entity. The Access Plane function may use transport services of MAC protocols (e.g. as MAC Control Elements, as MAC Control PDUs, and/or similar), for example, when the MAC entity perform the functions associated to the Access Plane.

[0164] An access plane may be considered to be established, for example, when a WTRU may be uniquely identified by access control functions. An access plane may be established, for example, when a WTRU can start transmission of user plane data. An access plane may be established, for example, when a WTRU receives a response that configures a capability for the WTRU to start performing (receiving and/or transmitting) dedicated transmissions, which may include when security is activated (if applicable) for the concerned configuration.

[0165] High level scoping of an access plane may be performed. For example, a WTRU may be configured to access resources associated with one or more radio access network nodes (e.g. TRP(s), TRPG(s) and/or NR-eNB(s)) using one or more of a set of functions, parameters and/or procedures.

[0166] For example, such procedures may include capabilities for a WTRU to perform an initial access (e.g. to establish access plane connectivity), perform a random access procedure and/or similar, for example, to obtain uplink timing alignment and/or further resources for uplink

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transmission, to select a suitable network node (e.g. based on measurements of downlink signals and/or based on reception of one or more responses to the initial request such as one or more RARs), to obtain a unique identifier (e.g. a dedicated RNTI), to obtain a configuration (e.g. for physical layer operation), to enable transmission of control signaling (e.g. a signaling radio bearer and/or equivalent) and/or to establish a Uu interface and/or equivalent with a corresponding network node.

[0167] An access plane may terminate a control signaling protocol. An access plane may be provided for component-specific applicability. For example, an access plane may control aspects related to (e.g. at most) an (e.g. one) access network node. For example, an access plane may provide services for control and/or configuration of a physical layer and/or configuration of a MAC instance associated with a (e.g. one) TRP/NR-eNB. Coordination between one or more, or multiple access nodes might not be assumed and/or useful, for example, in this case.

[0168] An access plane may be provided for plural-component applicability. For example, an access plane may control aspects related to one or more access nodes. For example, an access plane may provide services for control and/or configuration for a physical layer for one or more cells and/or configuration of a MAC instance, where (e.g. potentially) one or more, or each may be associated with applicable TRPs/NR-eNBs. For example, an access plane may support coordination of one or more aspects between different network nodes. Coordination may be per TRPG, per area, per signature and/or per set of access parameters. Coordination may be provided, for example, using a (e.g. single) MAC entity (e.g. with a coordinated scheduling function such as carrier aggregation-like assuming ideal interfaces) and/or by a control function that may interface with a WTRU for the configuration of one or more, or multiple MAC instances, e.g., when applicable (e.g. a multi-connectivity approach).

[0169] A central control plane (e.g. a RAN control plane) may be provided. RAN Central Control Functions (RCCF) may include control functions, protocols and/or context that may be WTRU specific and/or applicable to one or more TRPs/ACFs. A central control plane may be considered as an anchor control function that may terminate a control interface towards the core network (e.g. through configuration/setup of routing paths and transport paths, for example, based on tuples configured for a WTRU). An RCCF may (e.g. additionally) include control functions related to selection of a core network slice, CN-RAN interfaces, QoS management, security (e.g. master key management and/or key derivation, which may be per group of TRPs/NR-eNBs), WTRU capability management and/or WTRU reachability within RAN.

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[0170] WTRU context may be setup at RCCF (e.g. after CORE/NAS interaction). From RCCF point of view: a WTRU (e.g. from RCCF perspective) may have a known TRP(G) granularity (e.g. when access plane is active).

[0171] Central User Plane control functions may be (e.g. conceptually) defined as set of logical functions, parameters and/or procedures that may enable a WTRU to transfer user plane data with a network. Functions may be applicable to one of more user plane components (e.g. bearers, L2 transport path, flow-based routing entry, slice instance managing such, etc.). One or more functions may be part of the set of central control plane functions and/or may be logically separated therefrom.

[0172] Signaling may be generated and/or exchanged with one or more TRPs that may be part of a concerned user plane component. Central user plane functions may provide control for aspects that may be specific to a service, a slice, a bearer and/or a set of processing steps configured for the transport of one or more (e.g. specific) flows, which may be determined by configured tuples. A (e.g. one or more, or each) control function may be associated with a scheduler instance controlling one or more TRPs (e.g. over ideal backhaul). A WTRU (e.g. from its own perspective) may be configured to associate a specific central user plane instance with a signaling bearer and/or equivalent (e.g. a transport path/procedure) for control of a user plane component with one (e.g. single path/Uu) or more (e.g. multi-path/Uu) applicable MAC entities. A function may use transport services of corresponding MAC protocols, for example, as MAC Control Elements and/or similar.

[0173] An efficient data path may be setup between a TRP and a RAN Central User Function (RCUF) and/or between different RCUFs, e.g., when applicable. Connection oriented and/or connection-less user plane (e.g. WTRU assisted packet-based routing) may be supported.

[0174] RAN central user plane functions may comprise, for example, functions, protocols and/or parameters that may be service and/or data traffic specific.

[0175] There may be interactions between different control functions and components. A timing relation between access plane establishment and central control plane establishment may, for example, depend on a WTRU state. For example, a WTRU in a passive or IDLE state may transition to connected state by (e.g. first) establishing an access plane, e.g., using control signaling interaction with one or more access control functions (ACFs). For example, an access plane may be established as a result of an association procedure between a WTRU and a network. A WTRU may (e.g. then) trigger central control plane establishment, for example, using control signaling interaction with one or more central control functions. For example, a WTRU may establish a central control plane (e.g. only) and/or may establish a central control

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plane and a central user plane, for example, based on whether the WTRU has signaling traffic and/or data traffic. In an (e.g. another) example, a WTRU may (e.g. directly) transmit data without access plane establishment, for example, when the WTRU (e.g. in a loosely connected state) may have a central control context without an access plane established.

[0176] A WTRU may store a Central control plane context, for example, even after an access plane may be deactivated. Central control functions may (e.g. similarly) retain a WTRU context, for example, even after the access control functions release WTRU context and/or WTRU specific connectivity between access control functions and central control functions. Central control functions may (e.g. additionally) retain WTRU context, for example, even after central user functions release WTRU context and/or WTRU specific connectivity between central user plane functions and core network user plane functions. In other words, for example, a RAN control plane (e.g. SRBs) may exist without an active user plane (e.g. DRBs). For example, a WTRU may attach to a network without a corresponding data bearer establishment. A WTRU may (e.g. be required to) maintain central user plane context, for example, (e.g. only) when the central control plane context is active.

[0177] An access plane may be dynamically activated/deactivated, e.g., by access control functions and/or by central control functions, for example, when a control plane context is active.

[0178] WTRU connectivity may have one or more supported states. For example, a WTRU may operate according to one or more of the following states: idle mode; idle mode with connectionless transfers; and/or connected mode and/or loosely connected mode.

[0179] In an IDLE mode, for example, a WTRU might not have established connectivity with a network (e.g. a WTRU might not have ACF/ACP, RCCF/RCCP and/or RCUF/RCUP established).

[0180] In an IDLE mode with Connectionless Transfers, for example, a WTRU may have some connectivity with a network (e.g. it may have at least one ACF/ACP established with at least one user plane component, e.g., with a default configuration, e.g., for routing and/or security). A WTRU may have RCCF/RCCP established (e.g. a security context, access tables).

[0181] In a connected mode, for example, a WTRU may have complete connectivity with a network (e.g. it may have at least one ACF/ACP, RCCF/RCCP and/or RCUF/RCUP (e.g. when applicable) established with at least one user plane component).

[0182] In a loosely connected mode, for example, a WTRU may have some connectivity with a network (e.g. it may have at least one RCCF/RCCP established, e.g., a security context, access tables).

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[0183] Connectionless data transfer may be provided. A WTRU may establish an L3/RRC connection to transmit data PDUs irrespective of the size of the data packet. Establishing a connection may be difficult relative to one or more of: overheads associated with signaling to establish a connection at the RAN and/or Core network before the start of a small packet transfer; overhead associated with tearing down a connection after periods of inactivity; and/or WTRU battery drain to stay in connected mode for extended periods of time.

[0184] A WTRU may (e.g. directly) perform connectionless data transfer in a loosely connected state, for example, using a pre-existing context with a central control plane function. A pre-existing context may include (e.g. at least) a security context, WTRU subscription and/or WTRU capability configuration. A WTRU may (e.g. also) perform connectionless data transfer from an idle connectionless state, e.g., using a pre-existing context with the core network control function. A WTRU may (e.g. in this example) not have a RAN central context established. For example, a WTRU may be associated with (e.g. only) a default slice and/or a core network control function and may still transmit connectionless data. A WTRU may (e.g. in this example) include additional session information with a data PDU.

[0185] Connectionless data transfer may allow a WTRU to transmit data, for example, with one or more following characteristics/properties: without requiring access plane establishment; using modified msg1 (e.g. modified RACH preamble + data, multi-user non-orthogonal data channel, etc.); without receiving an explicit grant (e.g. contention based UL shared data channel); after UL synch (e.g. using piggybacked data with and/or as msg3); before UL synch to the network (e.g. using asynchronous access channel); and/or transmitting additional context information associated with the data PDU.

[0186] A WTRU may use a simplified security procedure that may, for example, involve one or more of: using stored context, which may be result of previous network interaction and/or hard coded security context in SIM; and/or explicit indication of security algorithm used.

[0187] A connectionless data transfer mode may allow a WTRU to transmit data PDUs earlier than connection oriented data transmission. Such data PDUs may be referred to as early data PDUs.

[0188] For example, a connectionless data transfer mode may (e.g. also) be used for downlink transmissions. For example, a WTRU may receive data PDUs in the same TTI with a paging message and/or along with the paging message itself. A network may trigger such connectionless downlink transfer, for example, when a WTRU location is known at a fine granularity and/or the size of the data packet is small.

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[0189] A WTRU may trigger connectionless data transfer, for example, based on one or more of the following criteria: a service (e.g. low overhead service and/or a low latency service, etc.); a size of a packet (e.g. when the size of the packet is less than a predefined number of bytes); WTRU buffer occupancy (e.g. when a WTRU buffer size is less than a predefined number of bytes); latency experienced by the packet (e.g. when the packet exceeds latency budget); packet filtering (e.g. WTRU may be configured with a packet filter/TFT to identify packets matching specific criteria, such as IP address, protocol, port number, type of service, flow label and/or a preconfigured session ID); absence of valid/configured logical connection (e.g. EPS bearer/Radio bearer); type of PDUs (e.g. initial signaling messages may use connectionless); WTRU mobility state (e.g. when WTRU speed and/or number of reselections/HO per second exceeds a threshold, which may be used to limit the number of handovers for medium/fast moving WTRU); a WTRU category; and/or an access class.

[0190] For example, a WTRU may (e.g. always) trigger a connectionless transfer, e.g., by default and/or as configured by an access table. A WTRU may (e.g. subsequently) transition to connection oriented transfer, for example, based on WTRU and/or network procedures described herein.

[0191] A WTRU may determine L1 and/or L2 configuration for connectionless transfer, for example, using one or more of the following procedures: a WTRU may apply a default configuration; a WTRU may apply a predefined configuration acquired via system broadcast (e.g. access table and/or system signature based) that may be specific to a access control function, to a central control function and/or to a TRP or a group of TRPs; a WTRU may apply a stored configuration (e.g. received upon establishing central control plane context) that may be dedicated for a WTRU or a group of WTRUs where the same configuration may be used across one or more, or multiple TRPs; and/or a WTRU may (e.g. explicitly) request connectionless transfer and/or may obtain specific configuration that may include transmission resources (e.g. contention based/non-orthogonal resources, layer2 configuration, etc.).

[0192] A layer 2 configuration may (e.g. in addition to a physical layer time/frequency resource configuration) include a max data rate restriction, bucket size, RLC mode, PDPC discard timer, security algorithm, etc. For example, specific MAC instances may be configured for connectionless transfer.

[0193] One or more connectionless configuration parameters may be associated with a validity timer. A WTRU may start a validity timer, for example, upon receiving configuration parameters. A WTRU may consider configurations, for example, (e.g. only) when the timer is

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running. A WTRU may delete/release configurations, for example, upon the expiration of a validity timer.

[0194] A WTRU may include additional context information with a data PDU, for example, to assist a network with processing and/or routing a data packet to an appropriate destination. Additional context information may be included, for example, in a layer 3 message and/or as a part of a layer 2 header field. For example, a layer3 message type may be defined to identify connectionless data. An IE (e.g. connectionless-data-IE) may be introduced in a layer 3 message (e.g. UL information transfer).

[0195] A WTRU may include one or more types of information as context information in an early data PDU.

[0196] For example, context information may comprise WTRU Identity information, which may comprise, for example, one or more of the following: an L3 identity that may have been allocated by a central control function during a previous interaction; an associated Identity of the central control function and/or an NAS level identity; an implicit indication of a portion of and/or a whole identity, e.g., using the selection of time/frequency resource; and/or a demodulation reference signal and/or unique word that may be a function of WTRU ID.

[0197] For example, context information may comprise a more data left indication and/or last PDU indication, which may indicate whether there are additional PDUs in WTRU buffer along with the early data PDU.

[0198] For example, context information may comprise one or more of: QoS related information, e.g., an indication to treat the early data PDU as a default QoS and/or as a non-default bearer data PDU; a low latency indicator, e.g., to allow a network to use low latency and/or an efficient data path; and/or a low overhead indicator, e.g., to allow a network to use a low overhead mechanism for transfer (e.g. a connectionless transport).

[0199] For example, context information may comprise application description and/or session related information, such as a predefined session ID, e.g., so a network knows which session a data PDU is associated with.

[0200] For example, context information may comprise forwarding/routing/transport layer information (e.g. a general packet radio service tunneling protocol (GTP) tunnel and/or a flow table entry and/or an index to flow table entry.

[0201] For example, context information may comprise security context information.

[0202] For example, context information may comprise destination ID, such as a control plane ID and/or a user plane entity ID, e.g., perhaps depending whether a PDU is a signaling PDU or data PDU.

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[0203] For example, context information may comprise user plane entity ID (e.g. when one already exists to avoid signaling towards RAN control plane entity), for example, for a RAN and/or Core user plane entity.

[0204] For example, context information may comprise control plane entity ID (e.g. entity with a valid WTRU context including subscription, security, etc.), for example, for a RAN Control entity and/or a core (e.g. MME ID + WTRU ID within the MME service area).

[0205] For example, context information may comprise slice identity, e.g., when a WTRU is already configured with a specific slice for connectionless transfer.

[0206] A WTRU may receive and/or may process feedback for a connectionless data transfer, where processing may be different from a connection oriented data transfer. A WTRU may (e.g. implicitly) determine the resources for feedback, for example, as a function of UL time/frequency resources used for early data PDU transmission and/or as a function of WTRU ID included in the data PDU.

[0207] Feedback (e.g. for data transmitted using connectionless/early data transfer based mode) may be associated with additional information, including, one or more types of additional information.

[0208] For example, additional information may comprise a WTRU ID for which feedback is sent (e.g., copied from UL Data PDU), e.g., where WTRU may verify the WTRU ID present in the feedback before processing the feedback message.

[0209] For example, additional information may comprise a timing advance (e.g. for async/contention based UL).

[0210] For example, additional information may comprise a power control command.

[0211] For example, additional information may comprise an ACK/NACK, e.g., where additional resources may be granted for retransmission for NACK.

[0212] For example, additional information may comprise a collision/contention indication, e.g., when WTRU action is based on a contention indicator, such as one or more of: when WTRUs can be distinguished at eNB (e.g., by orthogonal DMRS) and/or when WTRU receives other WTRU IDs in the feedback, a WTRU may transmit at next opportunity; and/or when WTRU receives a contention indication, the WTRU may perform, for example, a random back off and/or fallback to connection based data transfer.

[0213] For example, additional information may comprise an indication to trigger access plane establishment and/or fallback to connection oriented mode.

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[0214] For example, additional information may comprise additional UL resource grants and/or an Indication to go back to idle mode (and/or implicitly an ACK may be used to go back to idle mode), for example, depending on last PDU indication.

[0215] For example, additional information may comprise a request for WTRU identity and/or additional authentication procedure, e.g., when WTRU context might not be fetched and/or when WTRU may be unknown at the RCCF and/or the security check failure, etc., where a WTRU may respond to the authentication procedure and/or provide additional context information.

[0216] A WTRU may (e.g., in connectionless transfer mode) trigger a transition to connected oriented mode, for example, based on one or more of the following criteria and/or events: when a WTRU spends more than a predefined time in connectionless mode; when a WTRU receives a data packet with more than predefined number of bytes; when a WTRU transmits more than a predefined number of bytes in connectionless mode; when a WTRU buffer size exceeds a threshold; when a latency of buffered data exceeds a threshold; when a number of NACKs/retransmissions for an early data PDU exceeds a threshold; when a data rate over a predefined time window exceeds threshold; and/or when an activity timer exceeds a threshold, e.g., when an activity timer that may be (e.g. always) running when a WTRU enters connectionless transfer mode, where the activity timer may be reset to zero and started again, perhaps for example when the time between two consecutive packets exceeds a threshold.

[0217] For example, a WTRU may be configured to report one or more events. A network may determine whether to transition the WTRU to connection oriented mode. A WTRU may events, for example, using a control message and/or signal and/or piggyback indication in a connectionless data PDU. A network may (e.g., also) trigger a transition to connection oriented mode, for example, based on policies, type of services, WTRU subscription, WTRU mobility, etc. For example, a WTRU may transition from connection oriented mode to connectionless mode, for example, based on a network command (e.g., based on inactivity).

[0218] A user plane component may be (e.g., conceptually) represented as a transport path. A transport path may include, for example, one or more of the following: one or more Uu (which may be associated with a specific SOM and/or physical layer QoS) and/or a configuration thereof; a QoS profile (e.g., in terms of maximum latency, jitter, packet loss rate and/or the likes) and/or a configuration thereof; an association with one or more data flows and/or service (e.g., as indicated by a multiplexing function that may be based on logical radio bearer, tuples and/or a configuration thereof); routing table entries (e.g., in the network); a list and/or set of one or more

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matching rules; and/or a list and/or set of one or more tuples (e.g., to determine what logical path a packet may be directed to).

[0219] A distributed control plane for NR may have functions and/or components, which may be discussed from the perspective of their different applicability.

[0220] For example, a WTRU-specific function may be associated with an anchor control function. An RCCF may manage connectivity of a WTRU with a core network (e.g., PDN connectivity, reachability, etc.).

[0221] For example, a component-specific function may operate on one or more aspects of a single instance of a component for a given WTRU.

[0222] For example, a plural-component function may operate on one or more aspects of one or more, or multiple instances of a component for a given WTRU.

[0223] For example, control functions may be associated with MAC instances that may (e.g. also) map to a set of access control functions.

[0224] For example, control functions may be associated with a single MAC instance.

[0225] System information may be acquired, for example, as a WTRU-specific function, as a component-specific function and/or as a plural-component function.

[0226] A component of System information acquired as a WTRU-specific function, for example may include, a cell, TRP, and/or TRPG and/or groups thereof (e.g. everything a WTRU may find useful). On-Demand procedures, including requests and/or combination with already known SysInfo (pre-provisioning and/or acquired) may be described. SysInfo split may be supported. Out-of-band SysInfo may be supported.

[0227] A component of system information acquired as a Component-specific function may be, for example, a cell and/or a TRP. SysInfo split may be supported. Out-of-band SysInfo may be supported.

[0228] A component of system information acquired as a Plural-component function may be, for example, one or more, or multiple cells, one or more, or multiple TRPs, one or more, or multiple TRPGs, and/or one or more, or multiple NR-eNBs, etc. SysInfo split may be supported. Out-of-band SysInfo may be supported.

[0229] System information may be acquired, for example, using one or more approaches and/or procedures.

[0230] For example, system information may be acquired by broadcast, e.g., similar to LTE.

[0231] For example, system information may be acquired by splitting information in a first set of information and in a second set of information. Such information may comprise one or more system parameters. Such split of information may be based on one or more characteristics

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of the concerned information. Such characteristic may include whether or not the information is essential for accessing the concerned network resources, whether or not the information relates to a feature and/or function available using the concerned network resources, whether or not the information relates to a feature and/or function for low-latency access (e.g. URLLC), whether or not the information may enable specific UE procedures such as camping, measurements, and/or the like. Such first set may be further referred to as "Essential" information and/or such second set may be further referred to as "Non-essential" information. In some solutions, "Essential" information may be referred as Minimum-SI and/or "Non-essential" information may be referred as Other-SI. Such split may be network-controlled and/or vary from one area to another, where essential system information (if any) may be broadcast (e.g. to enable a WTRU to access the system and/or obtain further system information through dedicated resources. Broadcast information may comprise MIB, SIB1 (access-related information e.g. PLMN, TAC, CellID, p-Max, frequency band indicator), SIB2 (access barring information, RACH parameters, UL power control). The amount of broadcasted system information may vary (e.g., depending on the split between "Essential" and "Non-essential" information). For example, the amount of system information included in the broadcast may be one or more of the following: no broadcasted system information (e.g., pre-provisioning, acquired, and/or on-demand); MIB; MIB + SIB1; MIB + SIB1 + SIB2; (v) MIB + SIB1 + SIB2 + combination of remaining SIBs (e.g., SIB3 may be broadcasted to support cell reselection, etc.); and/or other combinations of "Essential" and "Non-essential" information. In some examples, there may be no "Essential" system information broadcasts. On-demand (dedicated) information may comprise obtaining remaining system information through dedicated resources (e.g. triggered through PRACH), where, on-demand acquisition may be based on a service (e.g. camping/paging etc.), WTRU capability, slice, etc.

[0232] For example, system information may be acquired by splitting information across broadcast and dedicated transmissions. A split may be network-controlled and/or may vary from one area to another. A flexible mechanism may be provided to support variable split between broadcast and dedicated information.

[0233] For example, system information may be acquired by system information modification, which may provide one or more mechanisms, for example: to update the delta, whether pushed and/or on-demand (e.g. WTRU-initiated and/or NW-initiated by control signaling ordering WTRU to start the procedure); and/or to request a specific element of system information (e.g. SIB).

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[0234] For example, system information may be acquired by variable acquisition, for example, based on location and/or frequency band (e.g. system information applicable in one location and/or for one carrier may be received in different locations and/or carrier).

[0235] Broadcast information may include specific information components related to specific services, such as a configuration for low latency access and/or for connectionless data transfers.

[0236] Essential information may be broadcast. Essential information may include, for example, MIB, SIB1 (access-related information e.g. PLMN, TAC, CellID, p-Max, frequency band indicator), SIB2 (access barring information, RACH parameters, UL power control). A WTRU may acquire broadcast system information and/or may request further system information, e.g., using an on-demand procedure.

[0237] More information (e.g. beyond essential information) may be broadcast, for example, based on capacity/load. For example, more system information may be broadcast, for example, perhaps when the system has the capacity and broadcast capacity is limited. A WTRU may acquire broadcast system information and/or may request further system information, e.g., using an on-demand procedure.

[0238] System information may be modified (e.g. changed and/or updated). For example, system information modification may be triggered by paging for WTRUs in RRC_IDLE and/or WTRUs in RRC_CONNECTED. A WTRU (e.g. when WTRU receives notification of system information modification) may identify a delta and/or may acquire modified/new system information, for example, by one or more procedures, such as broadcast (e.g. when a delta is broadcast) and/or on-demand (e.g. when a delta is not broadcast).

[0239] Variable acquisition may be based on location and/or frequency band. For example, deployment scenario may include macro and/or micro, wherein system information (e.g. for the macro and/or micro) may be broadcast over the macro. A WTRU may (e.g. when not in coverage of a macro) acquire system information from a micro.

[0240] System information may be variable portioned. Essential system information (if any) may be broadcast, for example, to enable a WTRU to access the system. A WTRU may acquire further system information through dedicated resources.

[0241] For example, more than essential system information (if any) may be broadcast, for example, when the system has significant excess capacity, when many WTRUs are acquiring system information and/or when a use arises to broadcast new system information that is essential for system access. It may be beneficial to support acquisition procedures allowing a variable/dynamic split between broadcast and on-demand information acquisition.

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[0242] System information may be grouped and/or may be controlled, for example, by different logical functions, e.g., based on periodicity, latency, feature, etc.

[0243] In one or more groupings, a default set may comprise, for example, information that may be essential for system access, camping, mobility, etc. Essential information may comprise, for example, common and shared channel information (e.g., similar to MIB, SIB1, SIB2 in LTE). Essential information may comprise, for example, cell selection/re-selection information (e.g. similar to SIB3, SIB4, SIB5(E-UTRA), SIB6(UTRA), SIB7(GERAN), SIB8(CDMA2000) in LTE).

[0244] In one or more groupings, a common set may comprise, for example, information that may be required by most devices, such as one or more of the following: HNB name (e.g. similar to SIB9 in LTE); ETWS (Earthquake and Tsunami Warning System) primary notification (e.g. similar to SIB10 in LTE); ETWS secondary notification (e.g. similar to SIB11 in LTE); and/or Commercial Mobile Alert System (CMAS) warning notification (e.g. similar to SIB12 in LTE).

[0245] In one or more groupings, a feature set may comprise, for example, information that may be required for particular features/device categories, such as one or more of the following: MBMS (e.g. similar to SIB13 in LTE); extended access barring for access control (e.g. similar to SIB14 in LTE); mobility procedures for MBMS reception (e.g. similar to SIB15 in LTE); GPS time and UTC time (e.g. similar to SIB16 in LTE); for traffic steering between E-UTRAN and/or WLAN (e.g. similar to SIB17 in LTE); sidelink communication (e.g. similar to SIB18 in LTE); sidelink discovery (e.g. similar to SIB19 in LTE); and/or SC-PTM e.g. similar to SIB20 in LTE.

[0246] For example, a WTRU may receive System Information (SI) applicable to a cell/TRP (and/or similar) and/or to a plurality thereof. A WTRU may receive SI, for example, by broadcast transmissions and/or by dedicated transmissions. For example, a WTRU may receive SI applicable to a cell/TRP on a transmission, for example, using resources associated with a different cell/TRP. SI applicable to a cell/TRP may include a (e.g. first) portion that may correspond to a (e.g. first) set of functions (e.g. access parameters, location tracking, WTRU-autonomous mobility related parameters, signature detection/measurement) and/or a (e.g. second) portion that may correspond to a (e.g. second) set of functions (e.g. supported features, supported services, etc.). The set of functions included in a (e.g. one or more, or each) portion may be a configuration aspect of the system and/or may be explicitly indicated in the corresponding transmission. Additional information may be included, for example, to indicate whether there is further SI (e.g. a second portion) applicable and/or the identity/type of further available SI (e.g. a bitmap representing the different SIBs). Additional information may, for example, include an indication whether a WTRU is required to acquire remaining information

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(e.g. one or more, or all remaining SIBs) and/or a subset thereof (e.g. SIB-based indication), which may be accompanied by an indication of an applicable procedure (e.g. DL broadcast and/or using an on-demand mechanism). Additional information may include a validity criteria for the SI.

[0247] For example, a WTRU may acquire SI for a cell, for example, using a broadcasting channel. A WTRU may (e.g. further) perform an initial access, e.g., to establish connectivity with the access network (e.g. ACP and/or RCCP). A WTRU may (e.g. subsequently) receive SI for one or more cell(s), TRP(s), etc. (e.g. similar and/or the like), for example, using a (e.g. dedicated) transmission such as a reconfiguration procedure. SI may be indexed, for example, using a characteristic associated with a reference signal (e.g. a signature, a positioning signal, etc.) that may be applicable. SI may be indexed, for example, for one or more, or each of the concerned cell(s)/TRP(s) and/or TRPGs. An SI may include (e.g. only) a portion of the information associated with a cell/TRP, such as access parameters. A WTRU may (e.g. subsequently) detect a reference signal associated with a configured SI. A WTRU may perform acquisition of further SI, for example, from a downlink broadcast channel (e.g. when applicable) and/or by initiating an access using the access parameters that are part of the configured SI for the concerned cell/TRP and/or detected reference signal / signature.

[0248] Additional SI may be acquired immediately. For example, a WTRU may initiate reception of broadcast system information, for example, when it determines that a broadcast channel may be available. A WTRU may initiate a procedure to request activation of a broadcast channel. A WTRU may (e.g. when it cannot receive broadcast SI using resources associated with the cell/TRP) initiate an access, for example, using access parameters that may be part of a configured SI for a concerned cell/TRP and/or detected reference signal/signature. A WTRU may initiate a procedure to request remaining SI for the concerned cell/TRP using dedicated resources thereof.

[0249] Additional SI may be acquired immediately, for example, when instructed and/or configured to do so. For example, a WTRU may initiate reception of broadcast system information, for example, when the WRTU determines that it is required (e.g. based on information in a first portion of the configured SI) to initiate such a procedure upon detection of a suitable reference signal (e.g. corresponding to a "known"/configured signature and/or received with sufficient power). A WTRU may use an applicable SI acquisition procedure, e.g., when configured.

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[0250] Additional SI may be acquired on demand. A WTRU may acquire system information, for example, through dedicated resources (e.g. triggered through PRACH). On-demand acquisition may be based on service, WTRU capability, slice, etc.

[0251] A WTRU may initiate on-demand acquisition of additional SI, for example, after initial access. A WTRU may request a default set of SI messages, for example, based on WTRU capability and/or based on previously used services.

[0252] A WTRU may initiate on-demand acquisition of additional SI, for example, when a WTRU initiates new services. A WTRU may request additional SI messages, for example, when the associated SI messages have not already been acquired.

[0253] A WTRU may initiate on-demand acquisition of additional SI (e.g. specific SI messages), for example, when a WTRU determines that stored SI messages are no longer valid, e.g. upon receiving a modification indication for one or more SI messages and/or upon receiving an unknown system signature.

[0254] A WTRU may initiate on-demand acquisition of additional SI, for example, based on expiration of a timer. A timer may be associated with the validity of stored system information.

[0255] In a WTRU terminated example, a WTRU may (e.g. at reception of service requests) request additional SI messages, for example, when associated SI messages have not already been acquired.

[0256] In a WTRU terminated example, a WTRU may receive control signaling (e.g. paging/PDCCH-order) that may trigger an acquisition/update. The procedure may be included in the signaling/order. Signaling may provide an indication of an applicable information component (e.g. one or more components to be updated).

[0257] For example, a WTRU may activate transmission of system information, for example, by transmitting an uplink signal. An uplink signal may be transmitted in resources that may be reserved for system information activation. For example, a specific time/frequency resource and/or a UL physical channel may be reserved for system information activation. In an (e.g. another) example, a WTRU may transmit a reserved RACH preamble, for example, to indicate a system information activation request. In an (e.g. another) example, a WTRU may transmit a UL signal on an asynchronous resource that may be reserved for system information activation. UL resources for system information activation may be specific to a TRP, a group of TRPs and/or a MAC instance. A WTRU may use a system information activation procedure, for example, to indicate interest in acquiring system information. WTRU identification by the network may be optional during a system information activation procedure.

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[0258] A WTRU may receive configuration for system information activation at different levels of granularity. For example, a WTRU may trigger different system information transmission behavior from a network based on UL signal type, UL resource selection, UL preamble selection, etc. Transmission behavior may include transmitting (e.g. only mandatory) system information, transmitting system information belonging to a specific slice, transmitting specific group of system information, etc. Transmission behavior may be, for example, one shot (e.g. for one or more, or each activation request one instance of the associated system information may be transmitted) and/or multi-shot (e.g. for one or more, or each activation request one or more, or multiple instances and/or repetition of the associated system information may be transmitted). For example, UL resources may be, for example, specific to a TRP and/or common to a group of TRPs. A WTRU may trigger TRP specific system information and/or TRP group specific system information, for example, based on the corresponding selection of UL resource.

[0259] The terms system information request and Other-SI request may be used interchangeably. For example, a WTRU may transmit a (e.g. an explicit) request message to trigger system information transmission. For example, a request message may include WTRU identity and/or type of system information requested. For example, a network may trigger security procedures, e.g. authentication as a response to a system information request procedure. A procedure may enable secure delivery of system information message. For example, a WTRU may acquire common system information via broadcast and/or activation procedure. A WTRU may (e.g. for slice specific system information) trigger a system information request procedure. A WTRU may (e.g. be required to) establish an access control plane, for example, to trigger a system information request message. For example, a WTRU may transmit its capability information (e.g. along with a system information request), for example, so a network may provide (e.g. only) the system information applicable for a WTRU capability.

[0260] For example, a WTRU may piggyback an SIB request together with a control signaling procedure. A WTRU may (e.g., implicitly) indicate a desire and/or usefulness for system information, for example, by transmitting additional indication with the control signaling procedure. For example, a WTRU may transmit a system information request bit/bitmap (e.g., along with a service request procedure), for example, to indicate a desire and/or usefulness for system information for that procedure. For example, a WTRU may include a value tag (and/or value identifier) associated with stored system information (e.g., along with a control procedure), for example, so a network may provide additional system information, e.g., when the value tag

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doesn't reflect the latest system information. A WTRU may trigger a control procedure, for example, by requesting system information associated with a control procedure.

[0261] A WTRU may trigger an other-SI request (e.g., towards a serving cell) to obtain other-SI associated with a neighbor cell. A WTRU may include identity and/or information associated with the neighbor cell (e.g., physical cell ID, EARFCN, global cell ID, and/or parts of MIB etc.) in the other-SI request. A WTRU may include a reference ID and/or a value tag of the neighbor cell in the other-SI request. A WTRU may include more than one neighbor cell identity in a single other-SI request message (e.g., to obtain other-SI for one or more, or multiple neighbor cells in a single procedure). Neighbor cell SI acquisition may be useful for the WTRU to perform autonomous mobility decisions towards that neighbor cell.

[0262] A WTRU may trigger an other-SI request to obtain other-SI associated with one or more beams. A WTRU may include identity and/or information associated with the beam, (e.g., beam ID, a reference signal associated with the beam, and/or parts of MIB in the beam etc.), in the other-SI request. A WTRU may include more than one beam identity in an other-SI request message to obtain other-SI for one or more, or multiple beams (e.g., in a single procedure).

[0263] A WTRU may include information about the stored SI in the other-SI request. For example, a WTRU may indicate the version and/or validity tag of SI stored in the WTRU memory during the transmission of other-SI request. The network may transmit (e.g., only) the delta and/or updated portion of the other-SI. Signaling overhead and/or acquisition time associated other-SI may be reduced.

[0264] A WTRU may include additional information in the other-SI request to request characteristics of other-SI broadcast. For example, a WTRU may indicate one or more aspects related to downlink signal quality in the other-SI request. Such indications may be used by the network to adapt the periodicity, for beamforming, for repetition, and/or MCS for the other-SI broadcast transmission. For example, a WTRU may indicate the desire and/or usefulness for more repetition and/or robust MCS when in a poor condition (e.g., cell edge and/or high path loss conditions). Also, as an example, a WTRU may indicate such a request based on a preamble selection, RACH resource selection, in the message portion of an enhanced RACH format, and/or in a field in a msg3 carrying other-SI request.

[0265] A WTRU may trigger a system information request procedure in any state (e.g., idle, inactive, and/or connected). A WTRU may or might not transition to a connected state to acquire the other-SI. A WTRU may perform a system information request by for example using a dedicated resource and/or a contention based resource.

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[0266] A WTRU may be configured with one or more rules for transmission of on-demand system information request that may be saved in memory as instructions executable by a processor. A WTRU may trigger (e.g., only) if one or more of the following conditions are satisfied. An example condition for triggering an on-demand system information request may be the status of essential SI. For example, a WTRU may request for other-SI (e.g. only) when the WTRU has up to date essential system information. A WTRU may abort any ongoing other-SI request if it determines a change in essential SI. A WTRU may acquire the essential SI and/or reacquire the other-SI according to the updated essential SI.

[0267] An example condition for triggering an on-demand system information request may be the absence of required information. For example, a WTRU may determine that the system information transmitted in the essential SI is not sufficient (e.g., for a specific procedure and/or operation in a WTRU state). A WTRU may determine that system information stored in the WTRU (e.g., based on previous other-SI request procedure and/or based on network assistance) is not sufficient (e.g., for a specific procedure and/or operation in a WTRU state). A WTRU may trigger other-SI request when a new procedure is triggered/started (e.g., for which the WTRU does not have a valid and/or stored SI associated with such procedure). For example, a WTRU may start a procedure, which may require operation in a numerology/SOM different from the current numerology/SOM. A WTRU may trigger an other-SI request to obtain system information relevant for the new numerology/SOM and/or may request system information for a specific numerology/SOM. For example, a WTRU may implicitly indicate request for a specific numerology/SOM based on the choice of resources (e.g. time/frequency or preambles) for other-SI request.

[0268] A WTRU may be preconfigured (e.g., saved in memory) with the list of SIs required for the supported procedures and/or operation in a WTRU state.

[0269] An example condition for triggering an on-demand system information request may be the absence of broadcast Other-SI; a WTRU may determine that the other-SI is not broadcasted. For example, a WTRU may determine the presence of other-SI based on scheduling information in the essential SI. For example, a WTRU may trigger other-SI request if a WTRU may determine that the broadcast of other-SI is stopped before the WTRU can acquire the required other-SI and/or if a WTRU determines that one or more specific other-SI required by the WTRU is not present in the current schedule of other-SI broadcast.

[0270] An example condition for triggering an on-demand system information request may be the support/presence of the other SI. For example, a WTRU may trigger the request for other-

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SI if (e.g., only if) transmission of such other SI is supported by the network. For example, a WTRU may determine the support of specific type of other-SI from the essential SI.

[0271] An example condition for triggering an on-demand system information request may be the WTRU not being prevented by access control from making such a request. For example, a WTRU may belong to one or more of many access classes. A WTRU may determine (e.g., may be required to determine) if requesting other-SI is not forbidden for its access class. For example, such forbidden access class for other-SI request may be broadcasted as a part of essential SI.

[0272] An example condition for triggering an on-demand system information request may be the presence of UL resources for other-SI request(s). For example, a WTRU may determine and/or receive the configuration of UL resources for system information request procedure. The configuration may include, e.g. UL RACH resources, RACH formats (e.g. including enhanced RACH formats).

[0273] An example condition for triggering an on-demand system information request may be the WTRU detecting change/update of other-SI and/or when WTRU determines the stored other-SI is invalid: a WTRU may monitor for the change in other-SI via signaling in broadcast message (e.g., MIB and/or essential SI and/or a paging message). A WTRU may monitor a change only for other-SI that are acquired and/or stored by the WTRU. A WTRU may receive the signaling indicating whether the modified other-SI is broadcasted and/or whether a system information request procedure is desired and/or useful. A WTRU UE may trigger other-SI request (e.g., only) if so indicated by the network. For example, a WTRU may apply stored other-SI instead of request for other-SI, upon determining the validity tag and/or similar matches (e.g., substantially corresponds) with the stored SI.

[0274] An example condition for triggering an on-demand system information request may be the discovery of a neighbor cell. For example, a WTRU may trigger other-SI request upon discovery of a neighbor cell for which the WTRU does not have a valid and/or stored system information. The WTRU may trigger an other-SI request based on quality of neighbor cells being above (or below) a predefined threshold.

[0275] A WTRU may start a timer A and/or a timer B (e.g., where timer A time > timer B time), when the first other-SI request message is transmitted. A WTRU may stop timer A and/or timer B when the WTRU completes the acquisition of other-SI. Upon expiry of timer B, a WTRU may retransmit the other-SI request message and/or restart timer B. A WTRU may be configured with a predefined number of retransmissions to acquire the other-SI until expiry of timer A. Upon expiry of timer A, a WTRU may consider the cell to be barred for a predefined

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duration (e.g., not use that cell). While timer B is running, a WTRU may monitor for the presence and/or scheduling of other-SI via a broadcast signaling (e.g., minimum SI, paging message, and/or via unicast signaling via downlink control channel).

[0276] As a step (in msg1), a WTRU may transmit a reserved RACH preamble to request system information. For example, such reserved RACH preambles may be used to indicate a specific system information block and/or group thereof, indicate the WTRU state (e.g., RACH preambles are associated to a WTRU state), indicate the system information for a type of service and/or group thereof, indicate aspect related to timing/latency for acquiring system information, and/or indicate that WTRU may perform data transmission following acquisition of system information.

[0277] A WTRU may be configured (e.g., programmed with executable instructions by a processor) to transmit an enhanced first message and/or msg1 for requesting other-SI. A WTRU may, in addition to a preamble portion in the enhanced first message, may include additional bits in a message portion. AWTRU may be configured (e.g., programmed with executable instructions by a processor) with predefined relations (e.g., in time and/or frequency between the preamble portion and message portion). A WTRU may indicate a request for other SI (e.g., based on a selection of a preamble sequence). A WTRU may indicate a specific type/group of other-SI requested (e.g., based on the reserved identity in the message portion). For example, a WTRU may transmit a preamble from a common pool and/or indicate the request for other-SI and/or specific type of other-SI (e.g., using the reserved identity in the message portion). A WTRU may be preconfigured (e.g., programmed with executable instructions by a processor) with the mapping of reserved identities to the types of other-SI. One or more WTRU identities may be reserved for such purpose. A WTRU may receive the configuration of reserved identity usage from minimum SI. The preamble may indicate the request for other-SI and/or the message portion may indicate connection establishment cause. A WTRU may be configured (e.g., programmed with executable instructions by a processor) to receive other-SI associated with a specific connection establishment cause, save such information and/or execute such received instructions. A WTRU may fallback to a normal msg1 (e.g., without message portion) if the retransmission of enhanced msg1 exceeds a threshold.

[0278] A WTRU may be configured to monitor for the MSG2 containing a response to the other-SI request. For example, a WTRU may be configured to monitor for a temporary identifier (e.g. a RNTI) specific to the other-SI request. For example, the temporary identifier may include a component specific to the other-SI request and/or the time/frequency and/or the preamble resource used for the other-SI request. For example, a WTRU may be configured to monitor a

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(e.g., single) temporary identifier that may be predefined for one or more, or all, other-SI requests, perhaps irrespective of the time/frequency/preamble resources used for the other-SI request transmission.

[0279] A WTRU may be configured to process the received MSG2, perhaps for example in response to an other-SI request. For example, the MSG2 format may be specific to the other-SI request, perhaps indicated by a separate type field. For example, the MSG2 response to the other-SI request may include the identity of the preamble associated with the other-SI request and/or may directly include an indication of the other-SI type. For example, the MSG2 might not include the timing advance, UL grant, and/or temporary identity. The MSG2 may include a bitmap of one or more, or all, the other-SI types that may be transmitted in an upcoming other-SI window.

[0280] A WTRU may be configured to process one or more MSG2 within a predefined time window, perhaps for example to determine the transmission status of one or more other-SI types. This may occue irrespective of whether the MSG2 corresponds to the MSG1 transmitted by the WTRU. The predefined time window may be configured, for example, in the minimum SI. The predefined time window may be related to the SI window of the SI being requested (e.g. a number of frames/subframes prior to the start of the SI window). This may be useful for the WTRU to determine one or more other-SI windows that may contain other-SIs of interest to the WTRU. This may include one or more other-SIs of interest for which the WTRU might not have been able to transmit the other-SI request. For example, a WTRU may be configured to monitor and/or process MSG2, perhaps until the WTRU receives the MSG2 including the response to requested other-SI and/or interested other-SI, and/or until the end of a predefined time window.

[0281] A WTRU may be configured to receive a MSG2 that may include a response to normal access by other WTRUs and/or a response to other SI request(s). The WTRU may distinguish the different responses in the same MSG2, perhaps for example based on the RAPID (ID of the RACH preamble). The WTRU, perhaps for example depending on whether it has performed access and/or SI request, may read the RAR (e.g., only the RAR) associated with the RAPID for which it transmitted a MSG1 (e.g., preamble).

[0282] A WTRU may be configured (e.g., programmed with executable instructions by a processor) with one or more actions/behaviors based on reception on a second message as follows. If no response is received by the WTRU (e.g., msg2 was not received), and/or the requested system information has not been received either through broadcast and/or through dedicated signaling within a certain period, the WTRU may re-transmit the system information request in msg1. If a WTRU receives the response in msg2, with indication that the requested

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system information is not available, and/or no further system information is available, the WTRU may perform no further actions for this procedure. The WTRU may receive a response in msg2. The response in the msg2 may indicate whether the WTRU should request in msg3 the specific SI the WTRU wants. For example, the WTRU may receive an indication that some or all other SI will be broadcast by the network, in which case the WTRU will not transmit msg3, and/or an indication that may instruct the WTRU to transmit msg3 with the specific other-SI to be requested.

[0283] If a WTRU receives the response in msg2, with indication that the requested system information will be broadcasted, the WTRU may obtain the scheduling information from the "Essential" system information and/or may acquire the applicable system information from the broadcast. These approaches may provide power savings and/or signaling overhead reduction (e.g., WTRUs in Idle mode or Inactive mode can acquire the system information while remaining within the respective state).

[0284] If a WTRU receives the response in msg2, with scheduling information of the requested system information, the WTRU may acquire the broadcasted system information using the scheduling information included in msg2. The WTRU may acquire the system information faster instead of obtaining the scheduling information from the next broadcasted "Essential" system information and then acquire the application system information.

[0285] If a WTRU receives the response in msg2, with an entry/index to the access table, the WTRU may retrieve the applicable system information from the access table. The WTRU may have low latency and/or resource efficiency since the WTRU had previously already acquired the access table.

[0286] If a WTRU receives the response in msg2, with timing advance, grant and/or indication to transition to the connected state in order to acquire the system information, the WTRU may transition to the connected state and acquire the system information using dedicated resources. The WTRU may have resource efficiency (e.g., when few WTRUs are requesting system information/accessing the system). The WTRU may have indicated (e.g., based on the selection of the reserved RACH preamble) that data transfer may occur after acquisition of system information.

[0287] A WTRU may receive the response in msg2 (e.g., the msg2 may carry complete and/or parts of other-SI). For example, a msg2 may schedule DL time/frequency resources that carry other-SI. DL resources may be either multiplexed in the same TTI as the msg2 and/or at an offset from the TTI carrying msg2.

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[0288] A WTRU may be configured to monitor the minimum-SI after transmission of other-SI request (e.g., for a pre-defined time interval). A WTRU may determine the scheduling configuration for broadcast of other-SI transmission based on the received minimum-SI.

[0289] A WTRU may be configured to monitor a paging message after transmission of other-SI request (e.g., for a pre-defined time interval). A WTRU may determine the scheduling configuration for broadcasting an other-SI transmission based on the received paging message.

[0290] A WTRU may transmit the Other-SI request in a MSG3. For example, a WTRU may be configured to transmit an other-SI request in MSG3, perhaps for example if no RACH resources are configured for the specific other-SI and/or combinations of other-SIs desired by the WTRU. A WTRU may be configured to use a specific RACH resource to transmit an other-SI in MSG3. A WTRU may be configured to utilize one or more, or any, RACH resource to initiate the procedure for other-SI in MSG3. The WTRU may select a RACH resource which has a specific timing relation (e.g., configured and/or specified/static) in relation to the SI window of the other-SI that may be requested. For example, the WTRU may perform an other-SI request by utilizing one or more, or any, RACH resource associated to a subframe/frame which may occur a certain time, and/or within a certain window, prior to the start of the SI window associated with the other-SI being requested. This can also be applicable for other-SI requests made using the techniques that use the MSG1.

[0291] A WTRU may indicate the reason for message3 transmission in msg1 (e.g., using either RACH resource/preamble resource selection and/or using an indication in the message portion of enhanced msg1). A WTRU might not provide any indication in msg1. A WTRU may utilize the grant received in msg2 for the transmission of other-SI request in msg3. The other-SI request may be an RRC message. A WTRU may receive msg4 as a response. The msg4 may be a RRC message carrying other-SI. The msg4 may carry an indication of whether the WTRU wishes, desires, and/or may find useful, to transition to a connected state or stay in the current state (e.g., idle, inactive etc.). Using RRC message for other-SI request may support Other-SIs (e.g., that could be introduced).

[0292] The WTRU may transmit the other-SI request in a msg3 and/or receive in msg4 information (e.g., information for obtaining other-SI). The information could include, for example, an RNTI to be used to receive the other-SI, time/frequency information about where to look for the other-SI (e.g., a specific subband of the control and/or data channel), validity information and/or validity tag associated with other-SI, and/or other parameters required to allow the WTRU to decode and/or receive the other-SI once it is transmitted. The WTRU may receive other-SI following reception of msg4 using the received information.

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[0293] A WTRU may use multi-stage RACH for an other-SI request.

[0294] A WTRU may transmit a request for other-SI with one or more, or multiple RACH transmissions and/or transmissions on contention-based resources.

[0295] For example, a WTRU may transmit a first RACH preamble to indicate the desire for other-SI, and/or the WTRU may use a subsequent RACH preamble to request the other-SI that should be transmitted. In the transmission of the preamble (e.g., first preamble and/or in the transmission of the subsequent preamble), a WTRU may use the selected preamble and/or the resources on which the preamble is transmitted (e.g., to indicate the desire for other-SI and/or the specific other-SI being requested).

[0296] The potential collision of msg3 transmissions by one or more, or multiple WTRUs transmitting other-SI requests simultaneously when a WTRU requests specific SI to be transmitted using msg3 may be avoided. The network broadcast of some or all the other-SI (e.g., if only a single preamble was used to request some or all other-SI in msg1) may be avoided.

[0297] A WTRU may use an initial RACH transmission.

[0298] A (e.g., first) RACH transmission may be performed using a preamble and/or on a PRACH resource (e.g., which is dedicated for initiating a multi-stage RACH procedure for other-SI request). This may be determined by the WTRU from broadcast signaling (such as in the Minimum SI) and/or preconfigured in the WTRU. The WTRU may initiate a multi-stage MACH transmission for other-SI request by selecting the dedicated preamble and/or RACH resource configured for such purpose and/or performing the RACH transmission (e.g., first RACH transmission).

[0299] A WTRU may be programmed with a processor with instructions for responding to a response to a RACH transmission (e.g., initial RACH transmission).

[0300] A WTRU may receive, in msg2, following a RACH transmission (e.g., initial RACH transmission), an indication of the presence of additional RACH resources and/or contention-based resources for transmitting request for other-SI. An indication may also include configuration information of the RACH resources, such as a preamble and/or resources to be used; mapping between preamble and/or resources and the other-SI to be requested; timing information related to the validity of the RACH resources and/or contention-based resources; timing information related to the reception of the other-SI; and/or C-RNTI and/or other identifier to be used for monitoring transmission of the other-SI.

[0301] A WTRU may receive an indication of whether to request other-SI using a second stage of RACH transmission and/or a transmission on contention-based resources and/or whether the WTRU should expect to receive other-SI (e.g., some or all other-SI) following the

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transmission of the RACH transmission (e.g. initial RACH transmission). For example, an msg2 message may indicate that additional RACH resources for indication of the other-SI requested will not be provided and/or the WTRU should receive some or all other-SI based on scheduling information of the other-SI, which the WTRU may have determined in the minimum SI.

[0302] A WTRU may have a processor programmed with instructions for determining RACH resources for second stage RACH transmission.

[0303] The WTRU may be configured (e.g., following transmission of the first RACH) with additional RACH resources and/or with contention-based resources (e.g., for indicating the specific other-SI being requested by the WTRU). The configuration of the additional RACH resources and/or contention-based resources used for requesting other-SI may be determined by the WTRU based on one or more of: msg2, preconfigurations and/or configurations of minimum SI, function of identity, and/or function of timing.

[0304] For received in msg2 configurations, the WTRU may receive a configuration of resources and/or preambles from the network in msg2 following transmission of a RACH transmission (e.g., initial RACH transmission). The configuration may be provided as an index into a table of specific RACH resources and/or preamble configurations known to the WTRU. The WTRU may receive several such indices representing one or more, or multiple configurations. The WTRU may receive the resources to use for the subsequent RACH transmission through an explicit grant. The grant may be accompanied by an indication that the grant is for transmission of a preamble identifying the other-SI being requested.

[0305] For preconfigurations and/or configurations of minimum SI, the WTRU may be pre-configured and/or configured by minimum SI to use defined RACH resources and/or RACH preambles for the other-SI. The WTRU may assume such resources are enabled/validated upon reception of an indication (e.g., RACH resources/RACH preambles activated). The indication may be received by the WTRU in msg2 and/or in a message in a separate PHY control channel.

[0306] For function of identity, the WTRU may determine the configuration of resources (time/frequency) for the second stage RACH resources based on an identity. The identity may be the cell identity, WTRU identity (e.g., temporary and/or provided in msg2), and/or network identity.

[0307] For function of timing, the WTRU may determine the configuration of resources (time/frequency) from the timing of msg2 reception and/or msg1 transmission. For example, the time location of the activated RACH resources may be configured as a predefined pattern of resources, which is offset from msg2 reception time by a specific amount.

[0308] The WTRU may map preamble/resources in second stage to other-SI.

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[0309] The WTRU may indicate the other-SI it is requesting (e.g., through the selection of the preamble) including the preamble sequence and/or other transmission characteristics of the preamble such as preamble length, numerology, and/or power. The WTRU may select a preamble based on the other-SI that the WTRU requires. The WTRU may randomly select a time/frequency resource for transmitting the selected preamble.

[0310] The WTRU may indicate the other-SI being requested through the selection of the resources used for transmission of the preamble from the set of RACH resources available for transmission of the second stage RACH. For example, the WTRU may determine the other-SI it requires to request and/or may select a resource from the set of configured time/frequency resources, which corresponds to the specific other-SI being requested. The WTRU may (e.g., randomly) select a preamble to transmit on that specific resource.

[0311] The WTRU may indicate the other-SI requested through a combination of the selection of preamble and resources. For example, a combination of a specific preamble and a distinct resource on which that preamble is transmitted may indicate the request for a specific SI.

[0312] Specific combinations of preamble and resources may be reserved for the WTRU to request one or more, or multiple other-SI and/or a set of SIBs (e.g., a set of SIBs and/or SI related to a specific feature).

[0313] The mapping between resources/preamble and specific other-SI (e.g., SIB and/or SI message) may be determined by the WTRU based on one or more of: reception of the mapped information in the minimum SI (e.g., the information related to the other-SI which is provided in minimum SI may provide such mapping); a preconfiguration and/or a fixed definition; a WTRU category (e.g., a WTRU of one category may have a different mapping compared to a WTRU of a different category); stored information (e.g., the WTRU may have stored mapped information from the same or a different cell's broadcast and/or may determine that such information is still valid); and/or specific ordering (e.g., the WTRU may assume one or more, or each other-SI (e.g., SIB number) corresponds to a preamble and/or a resource in increasing order). For specific ordering, the WTRU may associate a specific starting preamble and/or resource to the first SIB, which may be requested as other-SI, and/or the next SIB may use the next preamble and/or resource, etc. based on some ordered numbering. The SIB numbering may further be based on the SIBs that the cell has available. Availability information can be determined by the WTRU in the minimum SI.

[0314] The mapping of resource/preambles and other-SI requested by the WTRU may depend on information provided by the WTRU in the RACH transmission (e.g. initial RACH transmission). For example, the WTRU may have provided, (e.g., in the initial RACH

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transmission), some information pertaining to the other-SI that the WTRU would request in the second RACH transmission. The WTRU may provide a subset or a group of the other-SI in the initial RACH transmission. The WTRU may have provided this information through the specific preamble, resource selected in the initial RACH transmission, and/or using a RACH procedure (e.g., 2-step RACH procedure whereby additional data was transmitted along with the preamble). The WTRU may determine the mapping of the preamble and/or data to use and/or the other-SI requested using the second stage RACH transmission based on the subset or group which was selected in the first stage. For example, in case the preambles and/or resources are based on a specific ordering, the ordering may be applied (e.g., only) to the subset or group indicated by the WTRU in the first RACH transmission.

[0315] A WTRU may have a processor configured with executable instructions for the validity of second-stage RACH resources.

[0316] The resources for transmission of the second-stage RACH for request of other-SI may have a specific validity time. For instance, the WTRU may assume such resources are available upon reception of msg2 and/or upon transmission of msg1. Such resources may then be valid for a finite period of time following message receipt. A WTRU may assume the validity of received and/or enabled/validated resources based on a timer. For example, a WTRU may set a timer upon reception of msg2 with RACH resource activation indication and/or may (re)transmit other-SI requests using the configured RACH resources until expiry of a timer.

[0317] A WTRU may perform requests for other-SI using transmission of one or more, or multiple preambles in different RACH resources (e.g., in order to request different (e.g., possible sets of) other-SI). For example, a WTRU may transmit a specific preamble for one or more, or each, of the other-SI (e.g., SIB and/or SI message) used (e.g., required) by the WTRU and/or may continue to perform one or more, or all, preamble transmissions until the expiry of validity of the second-stage RACH preambles and/or until it may have received some or all of the required other-SI.

[0318] Distinct WTRUs may be programmed to transmit one or multiple requests for other-SI through regularly-occurring RACH resources, which may be temporarily reserved and/or configured for such by the network. Upon expiry of the timer, the network may then re-use such resources for normal scheduling. The configuration of RACH resources for the purposes of other-SI request will be provided (e.g., only) during the periods of time where the network knows there will be WTRUs using them (as a result of transmission of the first RACH by one or more WTRUs).

[0319] A WTRU processor may be programmed for retransmission of other-SI requests.

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[0320] A WTRU may be configured with one or more retransmissions upon transmitting/attempting to transmit other-SI request via a random access preamble, which implicitly and/or explicitly indicates other-SI request a during single, a multi-stage RACH transmission, and/or requests resources for other-SI transmission in msg3. A WTRU may retransmit other-SI request in a contention based and/or grant-free channel.

[0321] Upon transmission of other-SI request, a WTRU may be configured to monitor a minimum-SI for a predefined time interval to determine the presence of scheduling information associated with the requested other-SI. For example, the predefined time interval may correspond to a random access response window. A WTRU may retransmit the random access preamble (e.g., with power ramping) when one or more of the following conditions may be true: if no random access response is received within a response window; if the received random access response does not correspond to the requested other-SI, which may or might not correspond to the transmitted other-SI request preamble/message; if the minimum-SI does not indicate a schedule for requested other-SI during the predefined time interval; and/or if the maximum preamble counter associated with an other-SI request transmission is not reached.

[0322] A WTRU may consider the other-SI procedure to be successful and/or stop retransmissions of other-SI request, when one or more of the following may be true: if a received random access response corresponds to the requested other-SI, wherein the random access response may or might not correspond to the transmitted other-SI request preamble/message; and/or if a received minimum-SI indicates the presence of scheduling information for requested other-SI.

[0323] A WTRU processor may be programmed for actions related to reception of broadcast other-SI. A minimum-SI may refer to transmissions in one or more logical broadcast channels mapped to one or more physical channels providing system information (e.g., essential) directly and/or indirectly (e.g., via indexes to stored/pre-acquired information) for the WTRUs to utilize services (e.g., to camp, reselect, perform initial access, and/or request further system information) from a cell. For example, realization minimum-SI may include Master System Information Block (MIB) and/or one or more SI messages carrying one or more SIBs and/or downlink signals indicating one or more aspects related to a minimum-SI transmission. The SIBs not carried in the minimum-SI may be called other-SI. A WTRU may be configured to receive other-SI transmitted via broadcast, multi-cast (e.g., to a group of relevant WTRUs), simulcast (e.g., from two or more transmission points using SFN) and/or unicast (e.g., to a specific WTRU). Depending on the transmission protocol, a WTRU may be configured to receive other-SI on the same physical channels as minimum-SI and/or a different physical

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channel(s). WTRUs may be classified into the following different groups based on status of system information available at one or more, or each, of: WTRU: NULL WTRU; MSI WTRU; OSI UE; and/or FULL UE.

[0324] A NULL WTRU may be a WTRU without a valid minimum-SI and/or other-SI associated with the serving cell. For example, a NULL WTRU may have acquired and/or stored incomplete minimum SI and/or other-SI associated with the serving cell.

[0325] An MSI WTRU may be a WTRU with a valid minimum-SI but without other-SI associated with the serving cell. For example, an MSI may have acquired and/or stored minimum-SI, but not required other-SI for the ongoing procedures at the WTRU.

[0326] An OSI WTRU may be a WTRU with a valid minimum-SI and/or in the process of acquiring (e.g., re-acquiring) other-SI associated with the serving cell. For example, an OSI WTRU may or might not have triggered an other-SI request.

[0327] A FULL WTRU may be a WTRU with a valid minimum-SI and/or valid other-SI associated with the serving cell. For example, a FULL WTRU may have acquired and/or stored some or all the other-SI associated with serving cell and/or other-SI relevant for ongoing procedures at the WTRU.

[0328] An OSI WTRU may be configured to acquire other-SI transmitted as a response to an other-SI request. An OSI WTRU and/or a FULL WTRU may be configured to acquire other-SI transmitted as a result of update/changes to the other-SI. A NULL WTRU may be configured to pre-acquire other-SI before completion of minimum-SI acquisition.

[0329] A WTRU may determine the presence of other-SI scheduling information upon receiving an indication in a paging message. A WTRU may determine a change in value-tag associated with other-SI upon receiving an indication in a paging message. A WTRU may be configured with a timing relation between the other-SI request in the uplink and possible presence of other-SI schedule in the downlink. A WTRU may use the timing relation to determine the starting point for monitoring the presence of an other-SI schedule in a minimum-SI. For example, the timing relation may be expressed via a modification period. The timing relation may be expressed in relation to a paging occasion (e.g., the timing relation may be expressed as an offset in terms of timing units like a subframe and/or a radio frame). A WTRU may be configured with a timing relation in a paging message and/or in a response message to other-SI request.

[0330] A WTRU may be configured to suppress transmission of other-SI request based on reception of one or more downlink signals. For example, a WTRU may suppress the transmission of an other-SI request if a minimum-SI carries scheduling information for

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corresponding other-SI. A WTRU may suppress transmission of other-SI request if a minimum-SI indicates that the corresponding other-SI may be scheduled in the future. Suppression may be used to prevent duplicate transmissions of other-SI request (e.g., when a network is preparing for transmission of broadcast other-SI based on a previous other-SI request possibly from a same and/or different WTRU).

[0331] A WTRU may be configured to acquire the broadcasted other-SI using one or more signaling aspects common to minimum-SI transmission. For example, a WTRU may be configured to receive the scheduling information for an other-SI broadcast and/or a minimum-SI broadcast (e.g., from a common minimum-SI). A WTRU may be configured to determine the presence of an other-SI schedule in the minimum-SI (e.g., via a change in the value tag associated with the minimum-SI). A WTRU may be configured to receive the dynamic time/frequency resources for minimum-SI and/or other-SI broadcast using the common control channel characteristic (e.g., search spaces, RNTI and/or the like). A WTRU may be configured to receive the other-SI broadcast transmission in time windows overlapping with the minimum-SI transmissions. WTRUs not interested in the other-SI broadcast may be triggered not to perform unnecessary receptions.

[0332] A WTRU may be configured to acquire the broadcasted other-SI using one or more signaling aspects decoupled from the minimum-SI broadcast.

[0333] A WTRU may be configured to determine the presence of other-SI broadcast (e.g., via the presence of scheduling information in a minimum-SI message). For example, a minimum-SI may carry scheduling information for minimum-SI and other-SI. A WTRU might not assume a change in the value-tag associated with the minimum-SI due to the addition and/or removal of other-SI scheduling information in the minimum-SI. In another example, the minimum-SI (e.g., MSI-M) carrying scheduling information for minimum-SI may be different from minimum-SI (e.g., MSI-O) carrying scheduling information for other-SI. A WTRU may be configured with separate value tags associated with one or more, or each, of MSI-M and/or MSI-O.

[0334] A WTRU may be configured with non-overlapping time windows for a minimum-SI broadcast and/or an other-SI broadcast. For example, a WTRU may be configured with the first other-SI time window after the last minimum-SI time window (e.g., a WTRU may be configured with one or more other-SI time windows with one or more unused minimum-SI time windows). For a specific other-SI message, a WTRU may determine a number "n+m" where "n" may correspond to the order of entry in the list of SI messages scheduled by a scheduling information list associated in MSI-O. "M" may correspond to the highest index associated with the list of

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minimum-SI messages in MSI-M. For example, a WTRU may be configured with the same RNTI for minimum-SI reception and/or other-SI reception (e.g., a WTRU may be configured with the same control channel search space in time and/or frequency associated with minimum-SI and/or other-SI scheduling). An example of non-overlapping windows for minimum-SI and other-SI is shown in FIG 6.

[0335] A WTRU may be configured with one or more other-SI broadcast time windows partially and/or wholly overlapping with one or more time windows for a minimum-SI broadcast. A WTRU may be further configured with one or more aspects to avoid unnecessary reception of other-SI (e.g., when monitoring for minimum-SI). For example, a WTRU may be configured with an aspect of control channel monitoring that is different for minimum-SI as compared to other-SI acquisition (e.g., a WTRU may be configured with a separate RNTI associated with other-SI scheduling different from RNTI associated with minimum-SI scheduling). A WTRU may be configured with a control channel search space in time and/or frequency associated with other-SI scheduling different from control channel search space associated with minimum-SI scheduling. A WTRU may be configured with the other-SI transmission window length to be different than the transmission window length associated with minimum-SI. For example, overlapping windows for minimum-SI and other-SI is shown in FIG. 7.

[0336] A WTRU may determine beamforming applicability to system information delivery. A WTRU may be configured to determine whether beamforming is applicable for transmission of one or more system information messages. A WTRU may determine that system information delivery is beamformed (e.g., based on the carrier frequency). A WTRU may be configured with a predefined relationship between the frequency band and the nature of transmission. For example, a WTRU may consider system information to be beamformed for frequency bands higher than 6 GHz.

[0337] A WTRU may determine that system information delivery is beamformed (e.g., based on the characteristic of a downlink signal). The downlink signal may include a synchronization signal and/or any other reference signal. For example, characteristics of the downlink signal may include a type of the synchronization signal (e.g., a ZC sequence and/or a binary sequence), system signature, a root and/or basis sequence, and/or one or more predefined sequence numbers.

[0338] A WTRU may determine the nature of a system information transmission based on a relation between two or more synchronization signals in time and/or frequency. A WTRU may determine that system information delivery is beamformed (e.g., based on the information carried in a broadcast message). For example, a master system information block, a first system information message, and/or an essential system information (if any) may contain an indication

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that one or more system information may be beamformed. A WTRU may apply receive beamforming for system information reception (e.g., based on the measurements made on downlink signal quality). For example, a WTRU may apply receive beamforming for system information reception when the received power of a reference signal, a synchronization signal, a master system information block, and/or an essential system information (if any) is below (or above) a predefined threshold.

[0339] A WTRU may use uplink assistance to beamforming for system information delivery. A WTRU may provide uplink assistance information to a network element to assist the network element in performing system information delivery. A WTRU may transmit assistance information in an UL signal and/or an UL message (e.g., a transmission for system information activation, system information request, and/or a measurement report). A WTRU may provide transmit assistance information in a deployment applying beamformed transmissions for system information messages. A WTRU may be configured to acquire system information (e.g. using beamformed transmissions). WTRU assistance may help reduce on-demand system information overhead (e.g., reduce required number of beamformed transmissions) and/or reduce the time required for beamformed on-demand system information acquisition. A beam sweep may refer to transmission and/or reception of system information in a plurality of TX and/or RX beams associated with a transmission point and/or reception point (e.g., multiplexed in time, frequency and/or space). A WTRU may receive synchronization signal, master system information, and/or essential system information (if any) in a beam sweep operation. A WTRU may receive on-demand system information in a subset of beams used for transmission of synchronization signal, master system information, and/or essential system information.

[0340] A WTRU may determine assistance information (e.g., based on the measurement of one or more aspects related to downlink transmission). For example, the downlink beamformed transmission may include one or more of: a reference signal transmission (such as a reference signal specific to a beam, antenna port, cell and/or sector etc.), a synchronization signal transmission, a transmission of a master system information block, and/or a transmission of one or more essential system information, any other periodic system information transmission associated with the DL beams, and/or an initial transmission of on-demand system information. A WTRU may measure a received energy metric based associated with the downlink transmission (e.g., RSSI (Received Signal Strength Indication)). A WTRU may measure a quality metric associated with the downlink beamformed transmission. For example, the quality metric may be based on received reference signal power (such as RSRP, RSRQ), signal to noise ratio (such as SNR), and/or a channel quality indication (e.g., CQI) etc. A WTRU may measure

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one or more spatial metric associated with the downlink beamformed transmission (e.g., angle of arrival of a downlink transmission). A WTRU may average the measurement results over a predefined time window. A WTRU may use the result to determine the assistance information. A WTRU may consider/favor the measurement samples that are most recent based on freshness/age criteria to determine the assistance information.

[0341] A WTRU may indicate (e.g., via the assistance information) the quality of the serving cell based on one or more measurement metrics described herein. A WTRU may indicate (e.g., via the assistance information) whether to beamform the on-demand system information transmissions (e.g., based on one or more measurement metrics described herein). For example, a WTRU may provide the indication in cell edge and/or in a poor link condition where beamforming may overcome the increased path loss. A WTRU may determine whether to beamform the on-demand system information transmission (e.g., based on the received quality of the downlink transmission). For example, a WTRU may request a beamformed transmission of on-demand system information when the quality of the serving cell is below (or above) a predefined threshold. A WTRU may determine the usefulness for beamformed on-demand system information transmission based on the WTRU's capability. For example, a WTRU may consider the receive beamforming capability and/or the antenna gain achievable with receive beamforming. For example, a WTRU may request a beamformed on-demand system information transmission, when the quality of the serving cell is below a threshold in the presence of receive beamforming. A WTRU may indicate (e.g., via the assistance information) the reception status/quality of one or more downlink beams based on one or more measurement metrics described herein. A WTRU may indicate (e.g., via the assistance information) one or more downlink beams to receive the on-demand system information (e.g., based on one or more measurement metrics described herein).

[0342] FIG. 8A and 8B illustrate an example of an on-demand SI request in a beamformed context. At 802, a WTRU may determine one or more UL resources, perhaps for example based on one or more of: at least one (e.g., preferred) DL beam on which Sync and/or MIB and/or MSI and/or ESI may be received, an UL resource mapping to that DL beam, and/or one or more on-demand SI messages to be requested. At 804, the WTRU may transmit (TX) information for reception of the one or more on-demand SI messages using the one or more determined UL resources. At 806, the WTRU may receive a message (e.g., MSG2) that may be associated with the requested on-demand SI. At 808 the WTRU may monitor an on-demand SI window on Beam3 (e.g. a selected DL beam of one or more beams transmitted from the communication network) for the one or more on-demand SI messages.

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[0343] A WTRU may transmit assistance information. A WTRU may organize the measurement results and/or send a measurement report to the network. A WTRU may include a list (e.g., of one or more, or all) the downlink beams above a predefined quality metric and/or energy metric in the measurement report. A WTRU may be configured to transmit a list of N beams (e.g., best beams) in a measurement report. A WTRU may determine the number of beams to be reported based on the size of measurement report resource.

[0344] A WTRU may request for on-demand system information to be transmitted (e.g., in one or more specific beams). For example, a WTRU may request for on-demand system information in a DL beam (e.g., from which the WTRU received a synchronization signal, a master system information block, and/or essential system information). A WTRU may transmit the request (e.g., in a layer 3 message and/or a layer 2 control element).

[0345] A WTRU may indicate one or more DL beams to receive on-demand system information (e.g., based on a choice of an UL resource and/or a transmission on that UL resource). For example, the UL resource may be a sounding reference signal and/or a random access resource. One or more, or each preconfigured UL resource may be associated with one or more DL beams. A WTRU may obtain the mapping between a DL beam and an UL resource in a broadcast message (e.g., an essential system information (if any) and/or a time/frequency relation based on identity associated with the DL beam).

[0346] The assistance information may be piggybacked with an on-demand system information request and/or system information activation procedure.

[0347] The WTRU may indicate the identity of DL beams in the assistance information. A WTRU may determine the identity of a DL beam based on one or more of the following: based on reference signal sequence associated with the DL beam; based on antenna port associated with the DL beam; based on time/frequency resources associated with the DL beam; based on synchronization signal associated with the DL beam; and/or based on an (e.g., explicit) identity carried in a known downlink transmission on the DL beam (e.g., a master information block and/or an essential system information (if any)).

[0348] A WTRU may transmit assistance information in a layer 3 message. For example, the assistance information may be transmitted on a default signaling radio bearer.

[0349] A WTRU may transmit assistance information in a MAC control element. For example, a new field in the MAC header (such as a predefined LCID) may indicate the presence of assistance information.

[0350] A WTRU may transmit assistance information in a physical channel reserved for layer 1 control signaling.

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[0351] A WTRU may transmit assistance information on a contention based channel. Use of a contention based channel may be resource efficient. In case of collision of assistance information, at least the usefulness for on-demand system information may be conveyed by the presence of transmissions/signal energy in the contention based channel.

[0352] A WTRU may transmit assistance information before entering a connected state. For example, a WTRU may transmit assistance information on a common control logical channel.

[0353] A WTRU may transmit the assistance information in a message during connection establishment procedure. For example, a WTRU may include assistance information as a response to connection setup message.

[0354] A WTRU may transmit assistance information when an on-demand system information request and/or system information activation procedure is triggered.

[0355] A WTRU may transmit assistance information based on availability of measurement results. For example, a WTRU may start a timer upon achieving downlink synchronization to the cell. A WTRU may trigger on-demand system information with assistance information (e.g., if the measurement results are available before timer expiry). A WTRU may trigger on-demand system information without assistance information when the timer expires before the measurement results are available.

[0356] A WTRU may transmit assistance information when the acquisition of essential system information (if any) is complete.

[0357] A WTRU may transmit assistance information when explicitly requested by the network.

[0358] A WTRU may transmit assistance information based on an initial transmission of on-demand system information. Such assistance information may be included along with the feedback for such initial transmission.

[0359] A WTRU may determine DL resources for on-demand system information, for example, by using one or more of the following: a predefined timing relation between the system information request and start of control channel monitoring (e.g. a control channel may carry a scheduling grant for on-demand system information); and/or a predefined relation between time/frequency resources used for an SI request and start of data channel carrying on-demand system information.

[0360] For example, an identity (e.g. an RNTI) for an on-demand system information schedule may, for example, be specific to a WTRU that transmitted the request (e.g. a function of time/frequency resources used for UL SIB request). For example, an identity (e.g. an RNTI) for on-demand system information schedule may, for example, be specific to a cell and/or a

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predefined constant, which may allow opportunistic reception for WTRUs that did not transmit the SIB request. For example, an RNTI for periodic system information may be different from on-demand system information.

[0361] A WTRU may be configured with a temporary periodic resource and/or a semi-persistent resource for on-demand system information reception. For example, a WTRU may receive such a resource as a response to system information activation and/or an on-demand system information request. A WTRU may determine the end of an on-demand system information procedure.

[0362] For example, a WTRU may enter connected mode, e.g., to receive on-demand system information messages. A WTRU may be in a loosely connected state or idle connectionless state to trigger an on-demand system information procedure. A WTRU may determine the end of on-demand system information transmission using one or more criteria.

[0363] For example, a WTRU may determine the end of an on-demand system information transmission based on a predefined time-window. For example, a WTRU may consider the start of the time window as a start of a first DL transmission corresponding to on-demand system information and/or an end of the TTI containing the system information request. For example, a WTRU may consider end of on-demand system information upon the end of time-window.

[0364] For example, a WTRU may determine the end of an on-demand system information transmission, for example, based on explicit indication. For example, a WTRU may receive a special end-marker in the last TTI carrying on-demand system information.

[0365] For example, a WTRU may determine the end of an on-demand system information transmission based on a counter. For example, a WTRU may receive a countdown value in a (e.g. one or more, or each) on-demand system information. A WTRU may consider the system information carrying the countdown value as the last on-demand system information.

[0366] For example, a WTRU may determine the end of an on-demand system information transmission based on a candidate system information list. For example, a WTRU may be pre-configured with and/or may be signaled a candidate system information list to be acquired and/or associated with an on-demand system information procedure. A WTRU may consider end of on-demand system information transmission, for example, when (e.g. some or all) the system information in the list is received successfully.

[0367] For example, a WTRU may determine the end of an on-demand system information transmission based on an explicit release command. For example, a WTRU may (e.g. when the WTRU entered connected mode to receive the on-demand system information) consider an end

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of on-demand system information upon receiving a connection release command from the network.

[0368] A WTRU may process received on-demand system information. A WTRU may trigger a control procedure and/or transition back to idle mode at the end of on-demand system information reception.

[0369] A WTRU may consider a cell/TRP to be barred, for example, when a WTRU fails to acquire essential system information (if any) before the end of on-demand system information procedure.

[0370] A WTRU may start (e.g., first start) to apply received/acquired system information or parts thereof. A WTRU may apply/activate the received on-demand system information (e.g., at a specific reference point in time determined by the WTRU).

[0371] A WTRU may apply system information received via an on-demand procedure (e.g., at a specific time offset from the TTI corresponding to end of on-demand system information procedure as described herein). Such time offset may be predefined and/or transmitted along with the system information.

[0372] A WTRU may apply the on-demand system information (e.g., at the modification boundary after the completion of on-demand system information procedure). For example, a WTRU may reuse the modification boundary defined for essential system information.

[0373] A WTRU may apply the on-demand system information upon receiving an explicit activation message. A WTRU may receive such activation message via layer 3 signaling and/or MAC/Layer 1 control signaling.

[0374] A WTRU may apply the on-demand system information upon entering a specific state. For example, a WTRU may apply on-demand system information relevant to connected mode operation upon entering connected state. A WTRU may apply on-demand system information relevant to light connected operation upon entering light connected state.

[0375] A WTRU may apply the on-demand system information upon transmitting an indication to the network. For example, a WTRU may indicate competition of on-demand system information acquisition to the network and/or may apply (e.g., subsequently) the stored on-demand system information.

[0376] The WTRU may invalidate configured system information or parts thereof. A WTRU may receive, apply, and/or store the on-demand system information. A WTRU may monitor the validity of stored on-demand system information. A WTRU may stop using, deactivate, invalidate, overwrite, replace, and/or delete the on-demand system information based on one or more of the following criteria: validity of on-demand system information may be

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associated with WTRU state; validity of on-demand system information that may be associated with WTRU location; validity of on-demand system information that may be associated with validity of essential system information; validity of on-demand system information that may be associated with a timer; and/or an explicit indication of on-demand system information validity.

[0377] For validity of on-demand system information that may be associated with a WTRU state, a WTRU may receive on-demand system information after transition to connected mode. Such on-demand system information may be used (e.g., required) for operation in connected mode. A WTRU may consider the on-demand system information to be invalid upon exiting connected state.

[0378] For validity of on-demand system information that may be associated with a WTRU state, a WTRU may acquire on-demand system information while in light connected state. Such on-demand system information may be used (e.g., required) for operation in connected mode. A WTRU may consider the on-demand system information to be invalid upon exiting to light connected state.

[0379] For validity of on-demand system information that may be associated with a WTRU state, on-demand system information may be applicable for light connected and/or connected state. A WTRU may consider the on-demand system information to be valid across transition between light connected and connected state. A WTRU may consider the on-demand system information to be invalid upon transition to IDLE state.

[0380] For validity of the on-demand system information that may be associated with WTRU location, a WTRU may consider the on-demand system information received in a DL beam to be valid (e.g., only) within that DL beam. Such an approach may be extended for a group of DL beams. For example a WTRU may consider a received on-demand system information to be valid in a group of DL beams.

[0381] For validity of the on-demand system information that may be associated with WTRU location, the group of DL beams may be associated with the same control channel. A WTRU may consider the on-demand associated with the group of DL beams valid as long as the WTRU can reliably receive the control channel.

[0382] For validity of the on-demand system information that may be associated with WTRU location, a WTRU may consider the on-demand system information to be valid (e.g., only) within the cell from which the WTRU received the on-demand system information. A WTRU may consider the on-demand system information to be invalid when the measured quality of the cell is below (or above) a predefined threshold.

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[0383] For validity of the on-demand system information that may be associated with WTRU location, a WTRU may consider the on-demand system information to be valid in a geographical area, e.g. a RAN paging area and/or a list of preconfigured cells.

[0384] For validity of an on-demand system information that may be associated with validity of an essential system information, a WTRU may consider the on-demand system information associated with a transmission point, beam, cell, and/or region to be invalid if the validity of essential system information (if any) associated with the same transmission point/beam/cell/region becomes invalid.

[0385] For validity of an on-demand system information that may be associated with validity of an essential system information, a WTRU may be explicitly configured with the linkage between validity of one or more essential system information (if any) and validity of one or more on-demand system information.

[0386] For validity of on-demand system information that may be associated with a timer, a WTRU may consider the on-demand system information to be valid until expiry of a validity timer. For example, the value of validity timer may be specific to a valuetag (e.g. validity timer may be implicit based on ranges of valuetags and/or explicitly configured per valuetag). The value of validity timer may and/or specific to the type of system information (e.g. different timer values for MSI compared to OSI, and/or different validity for different types of SI within MSI and/or OSI). The value of validity timer may be specific to logical area, perhaps for example where the SI was acquired (e.g. a different longer value for SIs acquired in the current cell and/or current RAN area and/or shorter values for SIs acquired from non-serving cell and/or different RAN area).

[0387] For an explicit indication of on-demand system information validity, the on-demand system information may be associated with a validity tag and/or version. A WTRU may monitor the validity of stored on-demand system information using a validity tag in a broadcast message (e.g. MIB and/or SIB), paging message, and/or the like.

[0388] For an explicit indication of on-demand system information validity, the value tag may be specific to a single on-demand system information message, common to a group of on-demand system information messages, and/or common to some or all the on-demand system information messages from a transmission point/beam/cell/region.

[0389] A WTRU may use any combination of the above to stop using, deactivate, invalidate, and/or delete the on-demand system information.

[0390] A WTRU may re-acquire the specific SI that is changed (e.g., upon determining that an SI is invalid using one or more methods described herein). For example, the WTRU may re-

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acquire changed SI and/or refrain from re-acquiring unchanged SI. A WTRU may monitor minimum-SI for the schedule and/or trigger other-SI request for a specific SI to acquire (e.g., only) the required SI.

[0391] A WTRU may store different versions of SI in memory. A WTRU may determine validity in a specific cell of essential and/or on-demand system information obtained from a different cell and/or stored at the WTRU.

[0392] A WTRU may maintain and/or store in memory one or more, or multiple versions of SI from the network. Such different versions of SI may be received from the current serving cell, from a different cell, and/or from a different frequency layer. Stored SI may enable the WTRU to avoid acquiring SI after every cell change. A WTRU may determine a specific stored version of an SI applicable for a cell based on one or more aspects related to the DL transmission in that cell. A WTRU may consider spatial applicability and/or temporal applicability of a stored system information to avoid unambiguity and/or configuration mismatch between WTRU and the network.

[0393] A WTRU may use spatial applicability with SI. SI may be associated with an area for which it applies (e.g., where the area may correspond to a beam, group of beams, a cell, one or more, or each cell in an eNB, group of cells (within a RAN area, tracking area and/or similar), and/or a PLMN etc.). For example, a WTRU may be configured with a version of SI to apply in a geographical area covered by a group of cells. For example, a version of SI may be associated with the SI to be applied by the WTRU in different conditions (e.g., at different times of the day within the same cell).

[0394] A WTRU may use temporal applicability with SI. A WTRU may store one or more, or each instance of a received SI for a maximum of a timer ("T") (e.g., started when the WTRU first receives that SI). On expiry of the timer, a WTRU may delete the stored SI. The WTRU may have one or more, or multiple timers active (e.g., one or more, or each associated with a different SI instance).

[0395] A WTRU may use application of stored SI for cells transmitting a reference ID.

[0396] The term reference ID may refer to unique identity for a specific instance of an SI and/or a group of SIs. The reference ID may be unique over a predefined area and/or for a predefined time interval.

[0397] A WTRU may acquire SI from a transmission point that is not applicable to that transmission point (e.g., the SI may be applicable to a different transmission point). Thus, the WTRU may be configured to not assume an SI received from a transmission point that is applicable to that transmission point. A WTRU may be configured to associate an SI to a

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transmission point based on a reference ID associated to that SI. A WTRU may receive an SI from a transmission point and/or may apply the received/stored SI in a different transmission point, which may or might not transmit the corresponding SI. A WTRU may be configured to apply one or more SIs to a subset of beams from a transmission point. For example, a WTRU may activate one or more stored SIs based on the reference ID carried in a beam (e.g., implicitly based on reference signals in the beam and/or explicitly carried in a MIB associated with a beam).

[0398] A WTRU may determine to store a version of SI based on one or more reference IDs associated with one or more, or each version of SI and/or portions thereof. The reference ID for a version of SI may be broadcast by the network as part of the essential system information and/or along with the on-demand SI. For example, the reference ID may be implicitly determined by the WTRU by aspects related to the transmission by the network of the essential SI. For example, the WTRU may determine the reference ID for an SI based on the timing/frequency of the transmission of that SI relative to a reference time/frequency. In addition to the reference ID, and/or as part of the reference ID, the WTRU may also receive a value tag associated with the system information. The value tag may be used as in legacy LTE systems.

[0399] The reference ID and value tag may be independent identifiers received by the WTRU. For example, a single reference ID may be received by the WTRU, which may include a value tag. For example, a set of bits in the reference ID may indicate the specific version of the SI, while another set of bits in the reference ID may indicate the value tag associated with the version of the SI.

[0400] The reference ID may be applicable to all or part of the system information. For example, a WTRU may receive a reference ID (e.g., which may be applicable to some or all the SI transmitted by a cell (e.g., essential SI and/or on-demand SI)). A WTRU may receive a reference ID which is associated with the essential SI, and/or one or more different reference IDs associated with distinct portions of the on-demand SI. A WTRU may receive the reference ID and/or value tag associated with an SI or a portion of an SI via broadcast and/or dedicated signaling. A WTRU may be configured with the association of one or more sets of reference IDs and/or value tags with one or more sets of SI.

[0401] A WTRU may derive an implicit reference ID based on one or more aspects/characteristics associated with DL transmissions. A WTRU may associate the derived reference ID with one or more SI(s) based on predefined rules. For example, a WTRU may derive a reference ID based on a broadcasted area ID (e.g., a RAN area and/or a tracking area

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ID). A WTRU may be configured to apply the stored SI linked to a reference ID (e.g., while the WTRU can determine that the WTRU is within an area associated with that reference ID). For example, a WTRU may derive a reference ID based on the frequency layer and/or frequency band indication. A WTRU may be configured to apply the stored SI linked to a reference ID (e.g., while the WTRU can determine that a cell belongs to a frequency layer and/or frequency band). For example, a WTRU may derive a reference ID based on a geographical location (e.g., a WTRU may derive a reference ID based on part of global cell identity transmitted in a broadcast signaling). A WTRU may derive a reference ID based on characteristics of DL signals (e.g., logical sequence carried in a synchronization signal). A WTRU may associate the derived reference ID to one or a subset of received SIs. For example, a WTRU may determine the subset based on SI type (e.g., a WTRU may associate the derived reference ID to minimum-SI and/or other-SI). A WTRU may determine the subset based nature of physical channel carrying the SI (e.g., a WTRU may associate the derived reference ID to the SI carried in a physical channel dedicated for a SI transmission, a physical channel defined for single frequency network transmission, a SI transmitted on a physical shared downlink channel, and/or a SI transmitted on a beamformed physical channel. For example, a WTRU may be configured explicitly for the subset of SIs for which the derived implicit reference ID is applicable.

[0402] A WTRU may determine to apply a stored version of SI (e.g., upon detecting a cell which transmits a reference ID which matches (e.g., substantially corresponds with) at least one of the WTRU's stored SI versions). The match may also include, without loss of generality, some relational equivalence (e.g., greater than, less than, etc.). A WTRU may be allowed to perform cell operations with stored SI based on equivalence of the reference ID transmitted by a cell with a stored version of SI at the WTRU. A WTRU may be able to camp on a cell and/or perform INACTIVE/CONNECTED mode operations on that cell without acquiring SI from the cell (e.g., despite the cell transmitting a limited amount of SI and/or complete minimum-SI, one or more of which may include a reference ID). For example, a WTRU may camp on a cell which transmits (e.g., only) a portion of the essential SI (and including the reference ID) if the WTRU detects the reference ID matches (e.g., substantially corresponds with) the reference ID of a version of SI stored by the WTRU. A WTRU may consider a neighbor cell transmitting reduced minimum-SI as a candidate for reselection if the WTRU can determine that the reference ID of the neighbor cell (e.g., by receiving reduced minimum-SI from the neighbor cell and/or querying the serving cell) matches (e.g., substantially corresponds with) the reference ID of a version of SI stored by the WTRU.

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[0403] A cell may transmit the reference ID (e.g., to identify the SI version) and/or a value tag associated with that SI version. One or more reference ID and/or value tags may be transmitted by network cells. A cell may transmit the essential SI, which may be the SI for a WTRU to access the cell. A cell may transmit less than the essential SI while still transmitting the one or more sets of reference IDs and/or a value tag.

[0404] The reference ID and/or value tag may be assumed to be associated with the essential SI. A reference ID and value tag pair may be associated with the on-demand SI and/or a subset of the on-demand SI.

[0405] A WTRU may have a processor programmed with conditions for storing a version of SI in memory.

[0406] A WTRU may store in memory newly acquired SI associated with a reference ID for which the WTRU does not currently have any stored information. A WTRU may also maintain and/or store in memory the SI for a particular amount of time, for a specific area (e.g., as long as the WTRU does not move beyond an area or by more than a certain amount), and/or as long as the value tag associated with the reference ID has not changed. For example, a WTRU may invalidate/delete stored SI associated with a reference ID when it detects a change in the value tag transmitted by the network for SI with the same reference ID.

[0407] A WTRU may replace stored SI associated with a reference ID when it detects and/or determines transmission by a cell of SI with the same reference ID as a version of SI stored by the WTRU, but where the value tag has changed. The newly acquired SI may also be stored in memory by the WTRU as stored SI.

[0408] A WTRU may have a processor programmed with conditions for applying a stored SI version.

[0409] A WTRU may determine that the WTRU may change from a current version of SI to applying a stored version of SI upon reselection to a new cell, moving from an out of coverage condition to in coverage condition, upon detection of a change of the essential SI and/or parts of the essential SI transmitted by the network, upon detecting a change of the reference ID and/or value tag, associated with the SI and/or a different subset of the SI, upon leaving connected state, and/or upon receiving a handover command; for example a WTRU may receive a handover command with a reference ID and/or value tag (or value identifier). A WTRU may apply the stored SI associated with the received reference ID and/or value tag for operation in the target cell. This approach may reduce the size of the handover command and/or allow compressed signaling of target cell parameters. A WTRU may further determine, following the above events, that it may apply a specific version of stored SI based on one or more of the following

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scenarios: the reference ID of a version of the stored SI matches (e.g., substantially corresponds with) the reference ID currently broadcast by the cell (e.g., in the essential SI); the reference ID and value tag of a version of stored SI matches the reference ID and value tag currently being broadcast by the cell (for example in the essential SI) and/or provided by the cell in dedicated signaling; the implicit reference ID derived by the WTRU for the cell matches with the implicit reference ID stored for the essential SI; the time elapsed since the version of stored SI was acquired by the WTRU does not exceed a predefined and/or configured threshold; and/or the distance travelled by the WTRU since it acquired the specific version of stored SI is below a predefined and/or configured threshold. Upon applying the stored SI(s) associated with the matching reference ID(s), a WTRU may perform one or more actions as if those SIs are acquired in the current cell (e.g., monitoring possible updates to the applied SI, requesting for one or more other-SIs if missing, forwarding relevant information to upper layers (e.g., cell identity, tracking area code, supported features) etc.).

[0410] A WTRU may have a processor programmed with instructions for actions upon having no valid stored SI.

[0411] A WTRU may determine that the WTRU does not have a valid stored SI for a cell if the reference ID received from a cell does not match any of the reference IDs of stored SI versions at the WTRU. A WTRU may determine that the WTRU does not have valid stored SI if the value tag for a transmitted reference ID which matches (e.g., substantially corresponds with) the reference ID of a stored version of SI does not match the value tag of the stored SI having that reference ID.

[0412] A WTRU may, under such conditions, perform and/or determine to perform one or more of the following actions: the WTRU may acquire the SI from the cell and/or store in memory the SI with the associated reference ID and value tag (e.g., if the cell transmits the SI in question (essential SI and/or other-SI)); the WTRU may determine the cell to be barred and/or inaccessible; the WTRU may perform a cell (re)selection and/or attempt to camp on a recent cell and/or another detectable cell for which the above conditions do not occur (e.g., if the cell does not transmit the essential SI); and/or the WTRU may initiate a request for SI, such as some or all other-SI, and/or possibly for the other-SI for which the associated reference ID and value tag meet the conditions described herein.

[0413] A WTRU may have a processor programmed with instructions for requesting a reference ID and/or value tag of SI. The network might not broadcast the reference ID and/or value tag of an SI. For example, the network may transmit the reference ID and/or value tag of the on-demand SI with the SI itself, and/or may currently not be broadcasting any other-SI. A

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WTRU may perform a request for the reference ID and/or value tag for some or all or a specific subset of SI. The request may be triggered as a result of one or more of the following triggers: a WTRU reselects to a different cell; a WTRU, in reselecting to a different cell, has one or more versions of stored SI for the SI and/or subset of SI for which the WTRU is requesting a reference ID/value tag; a WTRU detects a change in another (potentially related and/or linked) reference ID and/or value tag broadcast by the network; a WTRU initiates a service requiring access to a certain SIB and/or subset of SI, for which the WTRU may potentially have stored SI which may be validated; a WTRU reselects and/or connects to a cell where the current reference ID and/or value tag associated with a required part of the SI is not being broadcast by the cell; a WTRU has moved by a certain amount; and/or the validity timer associated with a subset of SI (potentially related to the specific SI in question) has expired.

[0414] A WTRU may perform a request for reference ID and/or value tag for a subset of SI through RRC signaling. A WTRU may make the request in IDLE/INACTIVE states and/or in a CONNECTED state. A WTRU may utilize a RACH procedure (e.g., 2-step and/or 4-step RACH) to make the request. A WTRU may use PHY layer signaling on an UL control channel and/or dedicated resources using RRC signaling to make the request.

[0415] The WTRU may include in the request of one or more of the following information: one or more reference IDs and/or value tag of any stored SI at the WTRU; a WTRU ID (e.g., C-RNTI, S-TMSI, resume ID, etc.); and/or a specific SIB, SI subset, and/or SI type for which the WTRU is interested in obtaining a reference ID and/or value tag.

[0416] Following a request, a WTRU may perform one or more of the following actions: acquire essential SI that may contain at least a reference ID and/or a value tag; apply a specific version of SI that may be associated with a reference ID and/or a value tag transmitted by the network in response to the request; perform reselection to a different cell, which may be a cell utilizing an SI for which the WTRU has a stored valid version; perform a request for other-SI that may be a result of the WTRU determining that the WTRU does not have a valid stored version of the SI; determine the scheduling information associated with on-demand SI, potentially transmitted by the network in the essential SI; and/or acquire SI, potentially based on previously acquired and/or configured scheduling information. Examples include a reference ID applicable to essential and on-demand SI; a reference ID applicable to essential SI (e.g., only essential SI); non-broadcast reference ID for on-demand SI; broadcast reference ID for on-demand SI; and reference ID applicable for a subset of minimum-SI and/or other-SI.

[0417] For a reference ID applicable to essential and/or on-demand SI, a WTRU may reselect to a cell (e.g., new cell) which transmits all or part of the essential SI, but includes a

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reference ID (indicating the version) and/or a value tag. A WTRU may apply a stored version of the essential SI for the cell if the WTRU possesses a version of SI having the same reference ID and/or value tag. A WTRU may apply the stored essential SI and/or on-demand SI. The WTRU may determine that the reference ID and/or value tag transmitted by the network is applicable to essential SI and/or on-demand SI.

[0418] For a reference ID applicable to essential SI (e.g., only to essential SI), a WTRU may reselect to a cell (e.g., new cell) and/or may determine that the reference ID and/or value tag transmitted by the network is applicable to the essential SI (e.g., only the essential SI). A WTRU may apply a valid stored SI for essential SI. A WTRU may initiate a request for on-demand SI in the new cell and/or acquire the on-demand SI (e.g., if it is already being transmitted by the cell).

[0419] For non-broadcast reference ID for on-demand SI, a WTRU may receive a reference ID and/or a value tag for essential SI and/or one or more sets of reference IDs/value tags for the on-demand SI. For example, the on-demand SI may be divided into one or more, or multiple, subsets and/or types of on-demand SI. One or more, or each set may have its own reference ID and/or value tag. A WTRU may be configured with the subset information. A WTRU may receive the reference ID and/or value tag sets for the on-demand SI during the transmission of the on-demand SI itself (either through dedicated and/or broadcast signaling). A WTRU may reselect to a cell (e.g., new cell) and/or may detect transmission of the essential SI (e.g., essential SI only) and/or part of the essential SI which may include the reference ID and/or the value tag for the essential SI. For example, a WTRU may receive the reference ID and/or value tag of the essential SI, may determine that the WTRU has a valid version of stored essential SI, and/or may apply the stored essential SI.

[0420] The WTRU may determine that the WTRU does not have a valid version of stored essential SI and/or may acquire the essential SI from the cell. The WTRU may perform a request for on-demand SI if the WTRU does not determine that the cell is transmitting the on-demand SI. The WTRU may include, in the request for the on-demand SI, the reference IDs and/or value tag(s) of any on-demand SI. This information may be useful to the network to determine whether to broadcast on-demand SI.

[0421] The WTRU may receive, from the network, an indication to use the stored on-demand SI associated with a reference ID; an indication that the on-demand SI will be broadcast by the network; and/or the WTRU may start to receive the on-demand SI from the network as an indication that it should acquire the on-demand SI. The WTRU may perform a request to have the network transmit the reference ID and/or value tag associated with the on-demand SI. The

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WTRU may receive the reference ID and/or value tag pairs associated with one or more, or each set of on-demand SI, may determine the validity of any stored on-demand SI, and/or may determine whether to perform a request for on-demand SI.

[0422] For broadcast reference ID for on-demand SI, a WTRU may reselect a cell (e.g., a new cell) and/or may receive in the essential SI, and/or as part of the essential SI, an independent reference ID and/or value tag pairs for essential SI and/or on-demand SI. The WTRU may determine whether it has a valid version of the essential SI and/or may apply the determined valid version of the essential SI. If the WTRU determines that the WTRU does not have a valid version of the essential SI, the WTRU may acquire the essential SI and the cell may broadcast the essential SI. The WTRU may reselect to a different cell (e.g., if the WTRU determines that the WTRU does not have a valid version and/or the WTRU cannot acquire the essential SI). The WTRU may determine whether the WTRU has a valid version of one or more, or each set of on-demand SI. The WTRU may perform a request for on-demand SI for any set of SI for which the reference ID and/or value tag does not match a stored version of SI at the WTRU.

[0423] For a reference ID applicable for a subset of minimum-SI and/or other-SI, a WTRU may apply a combination of stored SI and the SI received from a cell. For example, a WTRU may determine that the reference ID broadcasted for a subset of minimum-SI and/or other-SI, remaining minimum-SI, and/or other-SI should be acquired from the cell. A WTRU may have stored only a subset of minimum-SI and/or other-SI associated with a broadcasted reference ID and/or may determine that the remaining minimum-SI and/or other-SI should be acquired from a cell. A WTRU may implement a subset of SI that is area specific. The remaining SI may be cell specific. A WTRU may be configured with semi-static system information common to an area that may be associated with the area specific reference ID, whereas more dynamic system information may be configured as cell specific SI. A WTRU may be configured with an overlapping subset of area specific SI and cell specific SI. A WTRU may apply precedence for SI transmitted from the cell over the area specific SI (e.g., applied via reference ID+ stored SI). A WTRU may apply two or more subsets of stored SIs based on two or more reference IDs to obtain a complete minimum SI in a cell. For example, a WTRU may receive and/or store different parts of minimum SI. One or more, or each part may be associated with a reference ID. A WTRU may determine the complete minimum SI by a union of different parts of the stored minimum SI.

[0424] A WTRU may determine a reception of a list of valid cells. A WTRU may receive (e.g., as part of the SI of a cell) a list of other cells for which the SI can be used for the cell. The WTRU may apply the same rules described above for a reference ID in relation to storage and/or

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may apply the SI. The WTRU may determine based on whether a cell is within the list of other cells (e.g., based on, for example, the PSS/SSS, and/or cell ID), whether the WTRU can apply acquired/stored SI in the cell, and/or whether the WTRU wishes, desires, and/or finds useful to acquire new (e.g., fresh) SI for a cell.

[0425] A WTRU may have a processor programmed to determine conditions (e.g., dependent conditions) for applying SI.

[0426] A WTRU may store different instances of SI (associated with the same or different reference IDs) and/or may apply (e.g., selectively apply) an instance of the SI based on certain conditions in the WTRU. The conditions may be configured in the WTRU and/or provided to the WTRU as part of the SI instances. The conditions may include one or more of: the time of day; the geographical location, speed, and/or heading of the WTRU; beam configuration; active service(s) and/or service type(s); and/or an active numerology.

[0427] A WTRU may have a processor programmed for actions related to reception of minimum-SI, reduced minimum-SI, and/or other-SI. A WTRU may be configured to receive "reduced minimum-SI" if transmitted. Reduced minimum-SI refers to a transmission of minimum-SI with a reduced size, whose contents are a subset of a complete minimum-SI, and may have one or more information elements not present in complete minimum-SI. A WTRU may be configured to receive reduced minimum-SI in one or more of the following ways: a DL signal as reduced minimum-SI (e.g., a WTRU may derive a reference ID based on one DL signal or a combination of two or more DL signals (e.g. synchronization signals, reference signals)); an MIB as a reduced minimum-SI (e.g., a WTRU may receive from a Master Information Block, one or more reference ID(s) and/or value-tag(s) associated with pre-provisioned SI(s)); a MIB and most frequent minimum-SI as reduced minimum-SI (e.g., a WTRU may determine one or more aspects related to a more frequent minimum-SI from a master information block and the frequent (e.g., most) minimum-SI may carry one or more reference ID(s) and/or value-tag(s) associated with pre-provisioned SI(s)); an MIB, most frequent minimum-SI, and one or more minimum-SI with configurable periodicity; and/or the WTRU may receive and/or apply a minimum-SI with configurable periodicity (e.g., configured in a most frequent minimum-SI) to obtain the complete minimum-SI.

[0428] A WTRU may be configured to receive one or more of the following information in a (e.g., complete) minimum-SI; a minimum-SI (e.g., most frequent SI) may include a reference ID(s) and/or validity tag(s) common to some or all minimum-SIs and/or specific to a subset of minimum-SI; and/or a reference ID(s) and/or validity tag(s) common to some or all other-SIs and/or specific to a subset of other-SI.

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[0429] A WTRU may be configured to determine a support for an SI based on the presence of a reference ID(s) and/or validity tag(s) for that SI. A minimum-SI may include the scheduling configuration for minimum-SI broadcast (e.g., MSI type, periodicity, window length) and/or one (e.g., only one) of the following for one or more, or each, supported other-SI: scheduling configuration for other-SI broadcast (e.g., other-SI type, periodicity, and/or window length) and/or RACH configuration to request other-SI.

[0430] Additional minimum SIs may include cell accessibility information (e.g., barring status, access control parameters, PLMN ID, cell ID, area ID etc.), initial access information (e.g., RACH configuration to enter connected state and/or data transfer in inactive state etc.), cell selection info (e.g., Qrxlevmin/offset, Qquallevemin/offset), and/or information for idle mode operation (cell reselection info for intra, inter neighbors, mobility scaling, common radio resource configuration (e.g., paging) etc.). A WTRU may be configured to request and/or receive one or more of the following information in other-SI: SI that might not be a part of complete minimum-SI and/or a reduced minimum-SI; SI that may be a part of minimum-SI (e.g., this may be useful for WTRUs that are coverage limited and/or may allow a less conservative design for broadcast minimum-SI); minimum-SI applicable for non-serving cells; and/or other-SI applicable for non-serving cells.

[0431] A WTRU may perform one or more of the following actions, perhaps for example when a system information acquisition procedure for a cell is triggered. If the cell transmits reduced minimum-SI, a WTRU may attempt to receive reduced minimum-SI. If reduced minimum-SI is received successfully by the WTRU, the WTRU may determine/derive one or more reference ID(s) associated with the cell. If the WTRU can determine a complete minimum-SI based on a received reduced-minimum-SI, derived reference ID(s), value-tag(s) and/or matching stored SI(s), the WTRU may perform one or more actions as if acquisition of minimum-SI was completed. If the WTRU receives configuration for resources for other-SI request from the reduced minimum-SI, a WTRU may trigger an other-SI request procedure to acquire one or more on-demand SI and/or perform one or more actions as if acquisition of minimum-SI is completed. A WTRU may assume that the cell is barred.

[0432] If the cell transmits complete minimum-SI, a WTRU may attempt to receive/determine a reference ID from the minimum-SI transmitted in the cell. If the WTRU can determine a complete minimum-SI based on reference ID(s), value-tag(s) and/or matching stored SI(s), a WTRU may perform one or more actions as if acquisition of minimum-SI is completed. A WTRU may attempt to receive complete minimum-SI transmitted in the cell. A WTRU may

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perform actions (e.g., subsequent actions) depending on the contents/status of received minimum-SI (e.g., whether WTRU is allowed to camp on the cell or if the cell is barred).

[0433] A WTRU may be configured to reclaim the random access resources (e.g., time/frequency and/or preambles) which may be configured for other-SI request(s), perhaps based on one or more factors. For example, a WTRU may reclaim the random access resources configured with the other-SI request(s), perhaps when the WTRU determines that the other-SI is broadcasted. For example, a WTRU may determine that the other-SI is broadcasted from an indication in the minimum-SI. For example, a WTRU may reclaim (e.g., only) the resources associated with a subset of other-SIs that may be broadcasted.

[0434] A WTRU may be configured to perform random access procedures for purposes other than other-SI request(s) on the reclaimed random access resources. For example, the WTRU may be configured to utilize the reclaimed random access resources configured for other-SI request(s) to perform an initial access and/or scheduling request and/or respond to a PDCCH order and/or to initiate UL synchronization and/or to initiate UL beam management and/or access target cell during handover, etc. For example, a WTRU may be configured to use reclaimed resources perhaps when the random access procedure fails on the resources configured for such procedure and/or on dedicated random access resources. For example, a WTRU may consider one or more, or a combination, of resources configured for access and/or reclaimed resources for random access resource selection.

[0435] A paging control function may be applied, for example, per TRP, per TRP group, per service, per configured MAC instance, per channel per instance, per central control function, etc.

[0436] A central control function may store a WTRU context and/or track a WTRU mobility within the coverage of RCCF, for example, for a WTRU in a light connected state. A WTRU may receive a paging message originated at the RCCF and/or transmitted by the RCCF triggered, for example, upon arrival of downlink data. A paging message may be transmitted, for example, at ACF granularity and/or RCCF granularity. A WTRU in a light connected state, e.g., upon receiving the paging message, may perform one or more actions.

[0437] For example, a WTRU action may resume a WTRU user plane path towards the central user plane function, e.g., without having to invoke any additional central control functions.

[0438] For example, a WTRU may perform control plane actions and/or user plane actions, e.g., based on the received paging message.

[0439] For example, a WTRU may receive additional indication(s) in the paging message that determine WTRU actions. For example, a WTRU may receive a type of service in the

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paging message. A WTRU may (e.g. based on the indication) transition to fully connected state or light connected state. For example, a WTRU may determine a type of initial access procedure (e.g. contention based, beamformed, initial access on a specific ACF), for example, based on a received paging message.

[0440] For example, a WTRU may receive an indication for the resources used for data transmission. A WTRU may (e.g. directly) receive the data without having to establish any connection. A WTRU may (e.g. upon completing data reception) transition back to idle or a light connected state.

[0441] For example, a paging message may trigger establishment of ACF. For example, a paging message may trigger RCCF establishment while another paging message may trigger resumption of RCUF.

[0442] WTRU identification may be provided, for example, by a layer 3 (L3)/central control plane connection/WTRU context identifier. Singular connectivity may have a one to one relation between WTRU identity on the radio (e.g. RNTI) and an RRC connection. A WTRU's RRC connection for dual connectivity may be associated with a WTRU specific RNTI in the MeNB (Master eNB). A WTRU may be assigned one or more, or multiple RNTIs during multi-connectivity (e.g. different RNTI per TRP), for example, in a tri-plane architecture. A WTRU context may be identified in the centralized control function, for example, by assigning an L3 identity to a WTRU. A WTRU may receive an L3 identity, for example, upon central control plane establishment. An L3 identity may be used, for example, to uniquely identify an RRC connection and/or RRC context associated with a WTRU.

[0443] An RCCF connection may be managed. There may be one or more triggers for re-association with RCCF. For example, a WTRU may trigger an association and/or re-association procedure with the RCCF when one or more of criteria are satisfied.

[0444] An example criteria may be when no valid L3 context exists in a WTRU, for example, due to a power up scenario where a WTRU may be unknown at the network, and/or an L3 context expired (e.g. due to extended periods of inactivity).

[0445] An example criteria may be when a WTRU enters a coverage of an anchor control function different than a serving anchor control function. A WTRU may determine presence and/or identity of an anchor control function using one or more procedures. An example procedure may comprise using a shared system signature. For example, TRPs associated with the same anchor control function may share at least one system signature. An example procedure may comprise using explicit identification in MIB. For example, TRPs associated with an anchor control function may transmit some form identity associated with the anchor

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control function. A WTRU may obtain the anchor control function identity during a previous association. An example procedure may comprise using logical area transmitted in broadcast channels. For example, an (e.g. one or more, or each) anchor control function may provide anchoring services to a logical area including one or more TRPs. A WTRU may consider TRPs belonging to a specific logical area as associated with the same anchor control function. An example of a procedure may be using a pre-configured system signature group. For example, two or more system signatures may be preconfigured to be associated with the same anchor control function. A WTRU may consider TRPs transmitting at least one of the system signatures within a particular system signature group to be associated with the same anchor control function.

[0446] An example criteria may be when an access control function associated with macro eNB experiences failure and/or a WTRU might (e.g. does) not have a valid access table entry.

[0447] An example criteria may be when (e.g. one or more, or all, of) the configured/activated access control functions may be terminated/released.

[0448] An example of a criteria may be upon arrival of a paging message indicating arrival of DL data and/or DL signaling from the core network.

[0449] An example of a criteria may be unreachability of a serving anchor control function, which may be determined, for example, based on an absence of response to signaling message towards the anchor control function and/or absence of keep alive/heart beat with the serving anchor control function.

[0450] An example of a criteria may be upon receiving a last RAR message. A WTRU may (e.g. during initial access to a network) perform a multi-point random access procedure. A WTRU may wait for a last RAR message to trigger an RCCF association procedure. A WTRU may determine the last RAR message in one or more ways. For example a (e.g. one or more, or each) RAR message may include a countdown value. For example, a WTRU may consider the RAR message with countdown value of zero as the last RAR message. For example, a WTRU may wait until the end of an RAR window to receive an (e.g. every possible) RAR message before triggering an RCCF association procedure.

[0451] A WTRU may initiate association towards an anchor control function, for example, any time after acquiring UL resources to transmit, e.g., after access plane establishment. A WTRU may transmit a higher layer signaling message that may include a WTRU identity, an identity of an anchor control function, a reason for association, a number of RAR messages, a list of TRPs and/or a selected list of TRPs.

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[0452] A WTRU identity may be, for example, one or more of the following: an identity allocated by a previous anchor control function, a temporary identity allocated by a core network and/or a sufficiently long random number (e.g. >= 40 bits).

[0453] An identity of anchor control function may be, for example, optionally present, e.g., when a WTRU had a previous association with an anchor control function.

[0454] A reason for association may be, for example, one or more of the following: a request for anchoring control service, a request for paging service, a request for access to specific core network slice, an initial association for subsequent core network signaling, an association due to change in anchor control function, a failure of a previous anchor control function, a response to paging, UL data arrival and/or type of service requested (e.g. high throughput service, low latency service and/or low overhead and energy efficient service), etc.

[0455] A number of RAR messages may be, for example, a number of RAR messages received in response to a random access procedure.

[0456] A list of TRPs may be, for example, a list of TRPs that transmitted the RAR messages and/or quality metric for a (e.g. one or more, or each) received RAR.

[0457] A selected List of TRPs may be, for example, a list of TRPs selected by a WTRU using a predefined selection criteria.

[0458] A WTRU may transmit an RCCF association request on available resources. A request may be transmitted in an order. An example of an order may be, for example one or more of: time/frequency resources associated with a macro ACF whose suitability metric is highest among available macro ACFs; time/frequency resources associated with a macro ACF whose suitability metric is above a certain threshold; time/frequency resources associated with a TRP ACF whose suitability metric is highest among configured/active/available TRP ACFs; and/or time/frequency resources associated with a TRP ACF whose suitability metric is above a certain threshold.

[0459] A suitability metric may be, for example, received power measured from a reference signal and/or system signature averaged over a time window.

[0460] A WTRU may prefer ACFs associated with one or more licensed bands over ACFs associated with unlicensed bands.

[0461] A WTRU may prefer non-beamformed ACFs over beamformed ACFs.

[0462] A WTRU may (e.g. in response to an RCCF association request) receive and/or process an association response. The contents of a response may include, for example, one or more of an identity of an RCCF, an identity of a WTRU, access table parameters, a measurement

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configuration, an SRB configuration, a DRB configuration, dedicated ACF parameters/resources and/or user plane RCUF status and/or parameters.

[0463] An identity of an RCCF may be stored and/or used (e.g. by a WTRU), for example, to address subsequent control signaling towards the RCCF.

[0464] An identity of a WTRU may be stored and/or used (e.g. by a WTRU), for example, to identity itself for subsequent interaction with the RCCF.

[0465] Access table parameters may be received in a response. A WTRU may (e.g. directly) receive access table contents within the association response message and/or parameters that may help a WTRU to obtain the access table parameters (e.g. ACFs and/or time/frequency resources that carry access table transmission, and/or an RNTI to decode the schedule for access table transmission, etc.).

[0466] A measurement configuration may comprise configuration of measurement resources, measurement objects, measurement quantity and/or measurement id, triggers, etc. A measurement configuration may be specific to an ACF or group of TRPs.

[0467] An SRB configuration may indicate mapping rules for SRB. For example, an SRB to ACF mapping (e.g. for SRBs terminating at ACFs) may provide (e.g. an explicit) mapping between SRBs and an ACF. A mapping may map an SRB to transport/physical channels associated with a specific ACF. For example, an SRB to ACF mapping restriction may be provided. A WTRU may be configured with restricted ACFs that might not be used for SRB transmission. WTRU may flexibly split the SRBs among available/allowed ACFs. For example, an SRB prioritization via ACF mapping may be provided. High priority SRBs may be mapped and/or low priority SRBs may be mapped, e.g., to a different ACF/ACF group. For example, Dynamic SRB mapping based on ACF quality may be provided. A mapping may transmit high priority SRBs over ACFs whose quality metric is above certain threshold. For example, a DRB configuration may include, for example, DRB tagging information. A WTRU may attach to a (e.g. one or more, or each) PDU belonging to a DRB associated tagging information provided by the central control function. Tagging information may be used, for example, by the RCUF to map the PDUs to the right core network flow. Dedicated ACF parameters/resources may be provided in a response to an RCCF association request. User plane RCUF status and/or parameters may be provided in a response to an RCCF association request.

[0468] An ACF connection may be managed. Triggers may be provided for access plane management. A WTRU may trigger access plane establishment, for example, when one or more criteria is satisfied.

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[0469] An example of trigger criteria may be, for example, when a WTRU receives an unknown signal (e.g. without a valid entry in the access table), which may occur when an SIB might not be broadcast in the cell, UL resource for SIB interest notification and/or on-demand access table and/or when a WTRU may request an access table entry from another TRP (e.g. send the signature).

[0470] An example of a trigger criteria may be, for example, upon arrival of user plane data (e.g. IP packet), which may occur, for example, when a WTRU already has an access plane established or does not have an access plane established, such as when higher layer data may allow for early data transfer and/or a valid entry in the access table is available that indicates UL resources timing (e.g. w.r.t to another signal and/or control channel, etc.).

[0471] An example of a trigger criteria may be, for example, upon arrival of control plane signaling (e.g. L3/RRC message and/or NAS message).

[0472] An example of a trigger criteria may be, for example, change in RAN tracking area, proximity to non-serving anchor control function, change in anchor control function, etc.

[0473] An example of a trigger criteria may be, for example, re-establishment of an access plane on a same or better TRP, for example, when a WTRU loses uplink synchronization (TAT expiration) and/or when a WTRU goes out of sync at lower layers.

[0474] An example of a trigger criteria may be, for example, WTRU mobility based on, for example, one or more of: a discovery of a new TRP associated with a serving anchor control function, a measurement events at (L1/L2/L3) above a predefined threshold; and/or a reception of a new system signature above (or below) a predefined threshold.

[0475] A TRP/network may trigger access plane establishment, for example, when one or more of the following criteria is satisfied: upon command from central control plane entity; upon receiving user plane data, e.g. paging; and/or upon an addition of a new TRP and/or cell group.

[0476] Access plane establishment may involve, for example, one or more of the following: a WTRU may trigger a random access on a predefined UL resource determined by system signature; and/or a WTRU may trigger a random access procedure on a multi-point random access resource.

[0477] A WTRU may consider an access plane established, for example, when it receives one or more RAR messages that pass a suitability criteria.

[0478] A WTRU may take one or more actions after establishing an access plane. For example, a WTRU may be uplink synchronized and/or may (e.g. be required to) maintain the synchronization.

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[0479] WTRU may be assigned an identifier, e.g., to uniquely identify a WTRU with a single TRP or a group of TRPs. For example, a WTRU may monitor downlink control channels for possible scheduling grants and/or feedback. For example, a WTRU transmit periodic and/or event triggered feedback and/or reference signals on the uplink control channels.

[0480] Access plane establishment may enable one or more of the following: a WTRU may be reachable at TRP level granularity; and/or a WTRU may be assigned dedicated physical resources (e.g. UL control channel resources, semi-persistent resources, etc.).

[0481] A WTRU may transmit higher layer data and/or signaling terminated at a TRP and/or signaling messages terminated at the RCCRF to setup control plane. A WTRU may (e.g. additionally) transmit L3 control/signaling, measurement report, NAS signaling messages, etc., for example, when the control plane may be set up. A WTRU may (e.g. additionally) transmit application/user data, for example, when the user plane is set up.

[0482] A radio link monitoring (RLM) function may be provided, for example, as a WTRU-specific function, a component-specific function and/or a plural-component function.

[0483] A WTRU-specific function, for example such as an RLM function may be configured per WTRU.

[0484] A component-specific function, for example such as an RLM function may be configured per WTRU-TRP pair and/or a WTRU-ACF pair.

[0485] A plural-component function, for example such as an RLM function may be configured per group of components, such as one or more, or multiple cells, one or more, or multiple TRPs, one or more, or multiple TRPGs, and/or one or more, or multiple NR-eNBs, etc. For example, a WTRU may perform radio link monitoring on one or more (e.g. a subset of TRPs per group of TRPs). A WTRU may consider the measurements on a TRP as indicative of radio link status for a group of TRPs. For example, a WTRU may consider measurements on a (e.g. any) TRP as indicative of radio link status for a group of TRPs.

[0486] A WTRU may be configured with a different monitoring procedure, for example, based on one or more of the characteristics/property of Uu with a TRP, a nature of a service and/or a WTRU state.

[0487] One or more characteristics/property of Uu with a TRP, for example such as an RLM procedure for a beamformed Uu may be different from a narrow band Uu. For example, an RLM may be optional in some scenarios, e.g., in an unlicensed Uu.

[0488] In an example of a nature of a service, one or more aspects of an RLM procedure may be tied to the type of services active in a WTRU. For example, a WTRU may perform RLM with (e.g. strict) thresholds while using a URLLC service.

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[0489] For example one or more aspects of an RLM procedure may be tied to one or more WTRU states. For example, a WTRU may perform a relaxed monitoring procedure in a light connected state, e.g., compared to fully connected state.

[0490] A radio link failure handling function may be, for example, a WTRU-specific function, component-specific function and/or a plural-component function.

[0491] A WTRU may support multi-connectivity to increase reliability, mobility robustness, throughput etc. For example, a relation between configured cells for a WTRU may be flexible. A (e.g. one or more, or each) cell configured for a WTRU may be dynamically assigned different roles. For example, a cell may be a Pcell, PScell and/or Scell, where roles may vary with time, e.g., based on predefined criteria and/or measurements.

[0492] A WTRU may (e.g. be required to) determine and/or may react to different types of failure. A WTRU may (e.g. with a distributed control plane architecture) distinguish between aspects related to connectivity to a TRP, reachability to different control functions, etc.

[0493] For example, a WTRU may determine different types of failure, such as a TRP level failure, an ACF level failure and/or an RCCF failure.

[0494] For example, a TRP level failure may be related to status of lower layer functions, e.g., loss of timing, unsuitability based on measurements below threshold, etc.

[0495] For example, an ACF level failure may be related to unreachability of a specific ACF. A WTRU may trigger a report to a central control function, which may include which ACF failed and/or a reason for failure.

[0496] For example, an RCCF failure may be related to unreachability of a central control function, for example, based on a timer expiring from the last interaction with RCCF.

[0497] A WTRU may decouple a capability to transmit data from different levels of failure on a control plane. For example, a TRP level failure might not trigger a WTRU to suspend the data transmissions. For example, a WTRU may continue data transmissions, for example, even while a control plane is being re-established. For example, a WTRU may perform connectionless transfer, for example, while trying to recover from partial control plane failure.

[0498] A mobility control function may be a WTRU-specific function, component-specific function and/or a Plural-component function.

[0499] WTRU mobility may be (e.g. closely) tracked at the RAN for WTRUs, e.g., in light connected states and/or IDLE connectionless states. Tracking may be at a granularity of a TRP group and/or a central control function. Different levels of mobility control functions may be defined, such as one or more of the following: Intra-TRP (e.g. may include beam level mobility); Inter-TRP (e.g. may include mobility handling at ACF level without involving a central anchor

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function); Inter-ACF (e.g. may be controlled by central anchor function and/or may be defined between LTE ACF and NR ACF in example of a tightly coordinated mobility function); Inter-RCCF (e.g. may be applicable for WTRUs in connected state and/or light connected state and/or a WTRU may support a control anchor change without a change to the user plane functions and/or user plane anchor); and/or Inter-RAT (e.g. may include mobility between NR to legacy RATs like GSM/UMTS, etc.).

[0500] Mobility control functions may be WTRU autonomous, network controlled, network assisted WTRU controlled and/or WTRU assisted network controlled.

[0501] Different parts of WTRU context and/or L2 state may persist after a mobility event. A WTRU may reset different parts of context and/or L2 state, for example, based on a type of mobility event. For example, a WTRU may use a specific set of rules to 'convert' a configuration/context upon handover to a different TRP/ACF. For example, a WTRU may retain parts of configuration and/or L2 context that are compatible while applying equivalent configurations and/or mapped configurations and/or while converting certain aspects during a mobility event between LTE and NR.

[0502] A WTRU may be configured with mobility restrictions. For example, a WTRU might not perform autonomous mobility to a LTE TRP.

[0503] A measurement configuration and reporting function may be a WTRU-specific function, component-specific function and/or a plural-component function.

[0504] A WTRU may transmit a measurement report to plurality of TRPs. A WTRU may, for example, based on a configuration, report beam related measurements (e.g. intra-cell beam level RRM measurements) to the associated TRP. A WTRU may report measurements of a plurality of TRPs to an associated ACF. For example, a WTRU may report measurements on LTE TRPs to an LTE ACF.

[0505] For example, a WTRU may differentiate measurements on TRPs associated with a serving central control function from the measurements on TRPs associated with a different central control function. For example, a WTRU may be configured to measure (e.g. only) the TRPs associated with a serving control function.

[0506] The placement of a measurement processing control function may be flexible. For example, a measurement processing control function may be placed closer to a WTRU, e.g., for URLLC service.

[0507] A security and authentication control function may be a WTRU-specific function, component-specific function and/or a plural-component function.

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[0508] A WTRU may treat security aspects associated with an ACF independently from other ACFs. For example, a security failure in ACF may be localized to that ACF and/or might not affect WTRU connectivity to other ACFs.

[0509] For example, a WTRU may perform independent integrity protection for control plane messages, such as control plane signaling towards an ACF and/or control plane signaling towards an RCCF.

[0510] For example, WTRU control signaling towards an RCCF may be placed in a container within ACF messages. A WTRU may apply (e.g. only) ACF integrity protection to the RCCF messages.

[0511] For example, a WTRU may obtain integrity protection keys for a (e.g. one or more, or each) ACF, for example, based on interaction with those ACFs. A WTRU may obtain integrity protection keys for an (e.g. one or more, or each) ACF from the RCCF.

[0512] Configuration failure handling may be a WTRU-specific function, component-specific function and/or a plural-component function.

[0513] A WTRU may trigger failure handling, for example, based on a control function that triggered the configuration. For example, configuration failure for an access control function might not affect WTRU association with other access control functions. A WTRU may report a failure to the RCCF indicating the specific ACF that triggered the configuration and/or the reason for failure, for example, when a WTRU is unable to comply with one or more aspects of a configuration. For example, a WTRU may perform connectionless signaling transfer, e.g., to report a configuration failure. For example, configuration failure towards a central control function might not affect WTRU capability to transmit data over the user plane. For example, configuration failure may trigger release of an access plane towards (e.g. one or more, or all) the access control functions.

[0514] A Logical association may be defined between PDU carrying control signaling. An association may, for example, be based on data units being associated with an access control function or an instance thereof, with a central control function or instance thereof and/or with the same SOM and/or slice. For example, an association may characterized, for example, by at least one of a chaining of processing functions, an applicable physical data (and/or control) channel (or instance thereof) and/or an instantiation of a protocol stack, which may include a specific portion being centralized (e.g. anchor control function) and another portion being closer to the edge (e.g. access control function).

[0515] An example of logical association may be a signaling radio bearer (SRB). A WTRU may have one or more, or multiple termination points for control signaling. A WTRU may a

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have signaling association towards an access control function, e.g., access signaling radio bearer (ASRB). A WTRU may (e.g. in case of multi-connectivity) have more than one ASRB. An (e.g. one or more, or each) ASRB may terminate at a different access control function. A WTRU may have a signaling association towards an anchor control function (e.g. a central SRB (CSRB)) that may terminate at the anchor control function.

[0516] A WTRU may transmit a control message on the same SRB that carried an original message, for example, when the control message is a response to a control message from a network (e.g. setup and/or reconfiguration message). For example, a WTRU may address a response to an access control function that transmitted the control message. In an (e.g. another) example, a WTRU may transmit a response to a control message received from a downlink cell group, e.g., in an uplink cell group associated with the same MAC instance.

[0517] An (e.g. one or more, or each) ASRB may be associated with a MAC instance. Mapping ASRB to physical channels may be specific to one or more, or each ACF instance. For example, the characteristics of physical channels that carry ASRB may be different from physical channels carrying data packets. For example, an ASRB may be mapped to physical channels with wider spatial coverage, for example, when a MAC instance utilizes beamformed channels.

[0518] A WTRU may use data transmission services provided, for example, by the access plane, e.g., to transmit a control signaling message towards an anchor control function.

[0519] A WTRU may be preconfigured with a (e.g. exactly one) MAC instance to transmit control signaling (e.g. a message) towards an anchor control function. For example, a MAC instance may be associated with a macro TRP.

[0520] For example, a WTRU may be configured with one or more MAC instances for CSRB transmission. A WTRU may shortlist candidate MAC instances, for example, based on one or more criteria, such as one or more of access plane status, UL TAT, prohibited MAC instances, coverage of a TRP, security status and/or activation status.

[0521] For example of an access plane status, a WTRU may choose MAC instances for which an access plane is already established.

[0522] For example of UL TAT, a WTRU may choose MAC instances with valid UL timing (e.g. TAT timer is running).

[0523] For example of prohibited MAC instances, a WTRU may consider one or more MAC instances that are not prohibited for CSRB transmission. For example, a WTRU may be configured with blacklisted MAC instances that might not carry CSRB transmission and/or (e.g.

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equivalently) a WTRU may be configured with whitelisted MAC instances for CSRB transmission.

[0524] For example of coverage of a TRP, a WTRU may choose MAC instances that are associated with a larger coverage, e.g., belonging to a macro TRP.

[0525] For example of security status, a WTRU may choose MAC instances associated with ACFs for which security context may be (e.g. already) established. For example, a WTRU might not consider MAC instances for which an authentication/security mode procedure is ongoing or not yet started. For example, a WTRU may wait for security activation for the access control function to complete before transmission of control message towards the anchor control function.

[0526] In an example of activation status, a WTRU may choose MAC instances that may be configured and/or activated by a network.

[0527] For example, a WTRU may have one or more, or multiple candidate MAC instances available for CSRB transmission. A WTRU may select a MAC instance for a CSRB transmission in one or more ways, such a based on signal quality, transmission opportunity, explicit priority, reliability, outcome of previous transmission and/or linked MAC status.

[0528] In an example of signal quality, a WTRU may choose a MAC instance with a better signal quality metric (e.g. RSRP/ RSRQ/Hypothetical PDCCH error rate) for one or more cells in the cell group associated with that MAC instance.

[0529] In an example of transmission opportunity, a WTRU may choose a MAC instance with the earliest transmission opportunity. A WTRU may prefer a MAC instance with an available scheduling grant over a MAC instance that may find a resource request procedure useful and/or may have (e.g. only) contention based resources. A WTRU may (e.g., temporarily) suspend transmissions on MAC instances that may have an outstanding reconfiguration procedure that reconfigures one or more characteristics associated with that MAC instance.

[0530] In an example of explicit priority, a (e.g. one or more, or each) MAC instance may be associated with a priority. A WTRU may choose the MAC instance with highest priority for transmission of CSRB messages.

[0531] In an example of reliability, a WTRU may choose to transmit the same control message over plurality of MAC instances, for example, for control messages that may require high reliability (e.g. those associated with ultrareliable services).

[0532] In an example of outcome of previous transmission, a WTRU may choose a different MAC instance (e.g. for retransmission) than the MAC instance used for a (e.g. an original) failed transmission.

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[0533] In an example of a linked MAC instance – WTRU may (e.g. for a response control message) choose the same MAC instance on which the corresponding request/setup control message was received.

[0534] For example, a WTRU may perform MAC instance selection (e.g. only) during initial registration and/or association towards a new anchor control function. A WTRU may use the same MAC instance for a (e.g. any) subsequent control message exchange with that anchor control function.

[0535] For example, a WTRU may perform MAC instance selection (e.g. once) for a (e.g. one or more, or each) control signaling procedure with the anchor control function. A control signaling procedure may involve one or more control signaling message transactions. For example, a (e.g. one or more, or all) control messages belonging to the same procedure may be transmitted over a (e.g. single) MAC instance.

[0536] For example, a WTRU may perform MAC instance selection for a (e.g. one or more, or each) control message transmission. For example, control messages belonging to the same procedure may be transmitted over different MAC instances. A WTRU may switch to a different MAC instance, for example, for a retransmission of the control message.

[0537] A WTRU may prioritize transmission signaling messages mapped to ASRB over control signaling mapped to CSRB. A WTRU may have an access control message and/or an anchor control message ready for transmission. For example, a WTRU may (e.g. first) transmit an access control message in the earliest transmission opportunity and/or may (e.g. subsequently) transmit the anchor control message in the same subframe/TTI from the same MAC instance or a different MAC instance, for example, when resources are available and/or in the next available resource from the same MAC instance or a different MAC instance. For example, a WTRU may wait for the completion of the ongoing procedure with the access control function and then transmit the anchor control message at the first available transmission opportunity. For example, a WTRU may be configured with two more ASRBs mapped to the same MAC instance. One or more, or each of the ASRBs may be identified by a different logical channel identity and/or ASRB identity. A WTRU may be preconfigured with rules to prioritize between two or more ASRBs mapped to the same MAC instance. For example, a prioritization may be implicit, e.g., based on the type of control message and/or based on explicit SRB identity/logical channel identity.

[0538] A WTRU may provide an (e.g. additional) indication in a PDU, for example, to differentiate a control message addressed to access a control function from a control message addressed to an anchor control function. For example, an indication may include one or more of

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the following: a logical channel identity, an explicit indication of a type of message and/or an explicit identity of an anchor control function.

[0539] In an example of a logical channel identity, a different logical channel identifier may be used to differentiate different ASRB within the same MAC instance. Logical channel identifiers may be reserved, for example, to indicate that the control message belongs to CSRB.

[0540] In an example of an explicit indication of a type of message, a (e.g. one or more, or each) control message may carry an indication for a type of the message. For example, a first type may indicate that it may be an access control message and/or a second type may indicate an anchor control message.

[0541] In an example of an explicit identity of anchor control function, a WTRU may (e.g. additionally) provide an explicit identity of a destination anchor control function, for example, when the access control function may be associated with more than one instance of the anchor control function. A WTRU may transmit a special/reserved identity, for example, to indicate lack of previous interaction with an anchor control function (e.g. a network may select a new anchor control function to deliver the control message).

[0542] A WTRU may receive a control message with configuration. A configuration may be applicable, for example, to a specific cell within a cell group associated with a MAC instance, to multiple (e.g. one or more, or all) cells within a cell group associated with a MAC instance, to a group of MAC instances or to one or more, or all MAC instances. For example, configuration parameters may include one or more of the following: slicing configuration, supported services configuration, addition/removal/modification of cells, QoS configuration, DRX configuration, security configuration, measurement configuration, dedicated radio resource configuration like SRB configuration, DRB configuration including PDCP and/or RLC and/or MAC configuration, physical channel configuration, SPS-configuration, etc.

[0543] A WTRU may determine the applicability of a configuration, for example, based on one or more criteria, such as a type of SRB, a linked MAC instance and/or an explicit access control identity.

[0544] In an example of a type of SRB, a WTRU may apply configuration parameters received in the ASRB applicable (e.g. only) to a MAC instance associated with the ASRB. A WTRU may consider the configuration parameters received in CSRB applicable to (e.g. one or more, or all) the MAC instances, e.g., unless explicitly indicated within the configuration message.

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[0545] In an example of a linked MAC instance, a WTRU may apply configuration parameters received from a cell/cell group to a MAC instance associated with that cell/cell group.

[0546] In an example of an explicit Access control function identity, a WTRU may receive configuration parameters with an explicit indication of a MAC instance to which the configuration is applicable. For example, a WTRU may receive a MAC identity and/or access control function identity, e.g., along with the configuration parameters.

[0547] For example, a WTRU may be configured with a linked-SRB. A linked-SRB may be an ASRB that may be associated with one or more DRBs. For example, linkage may be many-to-many association. A (e.g. one or more, or each) DRB may be linked to one or more ASRBs. A WTRU may apply configurations received in a ASRB to (e.g. only) the DRBs linked with the ASRB.

[0548] For example, a WTRU may (de)multiplex control signaling (e.g. RRC PDUs and/or the like) using different logical connections, bearers (e.g. SRB0, 1, 2, 3, etc. and/or using different sets thereof), flow-based treatment (e.g. based on configured tuples applicable to L3 protocols), for example, as a function of the logical grouping of the function that generated the RRC SDU.

[0549] For example, a WTRU RRC function for access plane establishment may generate an RRC SDU that may be mapped to a specific SRB. An SRB may correspond to a set thereof. A set may be associated with the Access Plane connection being established. For example, a procedure may use a first SRB corresponding to the set of SRBs available for establishment of such connection, for example, for initial access to the system (e.g. while security is not yet activated). A (e.g. the) procedure may use a second SRB otherwise, for example, when at least part of the security may be activated, e.g., for the RCCF. A WTRU may (e.g. in the latter case) include authentication (and/or encryption), for example, for at least part of the RRC SDU, e.g. the part of the SDU that may be used to determine the identity of a WTRU and/or may provide capability for the network to fetch a WTRU's context.

[0550] A WTRU RRC function for central control plane may (e.g. similarly) generate an RRC SDU that may be mapped to a different specific SRB (e.g. an SRB that may correspond to a different set of SRBs).

[0551] For example, different logical grouping of functions may have different sets of SRBs from each other.

[0552] For example, when a single set of logical paths may be configured, and/or when a WTRU may be configured with a (e.g. one) set of logical paths for one or more, or each type of

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logical grouping), an RRC SDU may include an identifier (e.g. the identity of the instance of the logical group of functions that generated the SDU), for example, when a WTRU may be configured with one or more, or multiple user plane "slices" and/or equivalent.

[0553] For example, procedures may be (e.g. further) applied, for example, (e.g. similarly) as a function of the physical transport paths. Grouping of functions and/or association of transport paths may be a configurable aspect, e.g., from a WTRU's perspective.

[0554] Systems, procedures, and instrumentalities (e.g. aspects of entities, interfaces and procedures in a wireless transmit/receive unit (WTRU) and/or network layers L1, L2, l3) have been disclosed for distributed control in wireless systems, such as 5G flexible radio access technology (RAT) (5gFLEX). Example procedures are provided for WTRU and network operation associated with a distributed control plane architecture, connectionless data transfer and dedicated system information acquisition. Distributed control may be provided, for example, by replicating a plurality of access control functions (ACFs) using a plurality of instances in a plurality of different transmission/reception points (TRPs) with multi-connectivity. The plurality of TRPs may concurrently provide control services to a WTRU. Centralized control functions may manage core network connectivity and/or a plurality of user plane instances for the WTRU and/or may facilitate coordination between the plurality of ACF instances for the WTRU in the plurality of different TRPs of the WTRU's configuration. For example, there may be a first access plane between the WTRU and a first TRP that provides a first ACF for the WTRU, a second access plane between the WTRU and a second TRP that provides a second ACF for the WTRU, a RAN central control plane between the WTRU and a first RAN central control function (RCCF) and a RAN central user plane between the WTRU and a RAN central user function (RCUF).

[0555] The processes and instrumentalities described herein may apply in any combination, may apply to other wireless technologies, and/or for other services.

[0556] A WTRU may refer to an identity of the physical device, and/or to the user's identity such as subscription related identities, e.g., MSISDN, SIP URI, etc. WTRU may refer to application-based identities, e.g., user names that may be used per application.

[0557] One or more, or each of the computing systems (e.g., WTRU) described herein may have one or more computer processors having memory that are configured with executable instructions and/or hardware for accomplishing the functions described herein including determining the parameters described herein and/or sending and receiving messages between entities (e.g., WTRU and network) to accomplish the described functions. The processes described above may be implemented in a computer program, software, and/or firmware

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incorporated in a computer-readable medium for execution by a computer and/or processor. Except as explicitly noted, determinations in reference to a computer generally refers to a processor programmed with instructions for determining. Likewise, the term store in reference to a computer generally means a processor programmed with instructions for storing in computer memory.

[0558] The processes described above may be implemented in a computer program, software, and/or firmware incorporated in a computer-readable medium for execution by a computer and/or processor. Examples of computer-readable media include, but are not limited to, electronic signals (transmitted over wired and/or wireless connections) and/or computer-readable storage media. Examples of computer-readable storage media include, but are not limited to, a read only memory (ROM), a random access memory (RAM), a register, cache memory, semiconductor memory devices, magnetic media such as, but not limited to, internal hard disks and removable disks, magneto-optical media, and/or optical media such as CD-ROM disks, and/or digital versatile disks (DVDs). A processor in association with software may be used to implement a radio frequency transceiver for use in a WTRU, terminal, base station, RNC, and/or any host computer.

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CLAIMS

What is Claimed is:

1. A wireless transmit/receive unit (WTRU) in communication with a communication network, the WTRU comprising:

a memory;

a processor, the processor configured at least to:

determine to request one or more system information (SI) messages from the communication network; and

determine if a transmission of the one or more SI message from the communication network will utilize at least one beamformed communication based on one or more communication parameters; and

a transceiver, the transceiver configured at least to:

receive at least one of the one or more SI messages from the communication network via the at least one beamformed communication.

2. The WTRU of claim 1, wherein the one or more communication parameters include a frequency band of the transmission, the processor being further configured to:

compare the frequency band of the transmission to a predetermined threshold; and

determine that the transmission of the one or more SI messages from the communication network utilizes at least one beamformed communication based on the frequency band of the transmission exceeding the predetermined threshold.

3. The WTRU of claim 1, wherein the one or more communication parameters include a characteristic of a downlink signal, the transceiver being further configured to:

receive the downlink signal, the processor being further configured to:

identify the characteristic of the downlink signal; and

determine that the transmission of the one or more SI messages from the communication network utilizes at least one beamformed communication based on the identified characteristic of the downlink signal.

4. The WTRU of claim 3, wherein the downlink signal includes a reference signal.

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5. The WTRU of claim 4, wherein the characteristic of the downlink signal includes one or more of: a type of the reference signal, a system signature, a root signature, a basis sequence, or one or more predefined sequence numbers.

6. The WTRU of claim 5, wherein the type of the reference signal is a synchronization signal.

7. The WTRU of claim 1, wherein the one or more communication parameters include information provided in a broadcast message, the transceiver being further configured to:

receive the broadcast message, the processor being further configured to:

identify the information in the broadcast message; and

determine that the transmission of the one or more SI messages from the communication network utilizes at least one beamformed communication based on the information in the broadcast message.

8. The WTRU of claim 7, wherein the information provided in the broadcast message is included in at least one of: a master system information block (MIB), or a system information block (SIB), or a system information message.

9. The WTRU of claim 1, wherein the one or more communication parameters include a quality of a downlink signal, the transceiver being further configured to:

receive the downlink signal, the processor being further configured to:

measure a quality of the downlink signal; and

determine that the transmission of the one or more SI messages from the communication network utilizes at least one beamformed communication based on the quality of the downlink signal being below a predetermined threshold.

10. The WTRU of claim 9, wherein the downlink signal includes a reference signal, and the quality of the downlink signal includes a received power of a reference signal.

11. The WTRU of claim 1, wherein the processor is further configured to initiate an uplink (UL) request to the communication network for the one or more SI messages.

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12. A wireless transmit/receive unit (WTRU) in communication with a communication network, the WTRU comprising:

a memory;

a processor, the processor configured at least to:

determine to request one or more system information (SI) messages from the communication network;

conduct a beam sweep operation of one or more downlink (DL) beams transmitted from the communication network;

identify at least one DL beam of the one or more DL beams via which to receive the one or more on-demand SI messages based at least in part on the beam sweep operation;

determine one or more uplink (UL) resources with which to communicate information for a WTRU reception of the one or more on-demand SI messages, the information for the WTRU reception including the at least one DL beam; and

initiate the request for the one or more on-demand SI messages from the communication network; and

a transceiver, the transceiver configured at least to:

send the request for the one or more on-demand SI messages to the communication network using the one or more UL resources, the request including the information for the WTRU reception of the one or more on-demand SI messages; and

receive at least one of the one or more on-demand SI messages from the communication network via the at least one DL beam.

13. The WTRU of claim 12, wherein the one or more UL resources are mapped to the at least one DL beam.

14. The WTRU of claim 12, wherein the processor is further configured such that the one or more UL resources are determined based on at least one of: the at least one DL beam of the one or more DL beams, a mapping between the one or more UL resources and the at least one DL beam of the one or more DL beams, or the requested one or more on-demand SI messages

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15. The WTRU of claim 12, wherein the processor is further configured such that the request for the one or more on-demand SI messages is sent as part of a Random Access Channel (RACH) transmission.

16. The WTRU of claim 12, wherein the processor is further configured such that the at least one DL beam of the one or more DL beams is identified based on which of the one or more DL beams at least one of: a synchronization signal, a master system information block (MIB), or essential system information is received in the beam sweep operation.

17. A wireless transmit/receive unit (WTRU) in communication with a communication network, the WTRU comprising:

a memory;

a transceiver, the transceiver configured at least to:

receive system information (SI) from the communication network at a first-time instance; and

a processor, the processor configured at least to:

determine a first-reference identifier (ID) that corresponds to at least some of the SI of the first-time instance;

determine a first-value identifier (ID) that corresponds to the at least some of the SI of the first-time instance;

associate at least one of: the first-reference ID, or the first-value ID with the at least some of the SI of the first-time instance;

utilize the at least some of the SI of the first-time instance in communication with the communication network;

search the memory for stored SI of a previous-time instance that is associated with the same first-reference ID of the at least some of the SI of the first-time instance;

store the at least some of the SI of the first-time instance upon no stored SI of the previous-time instance associated with the same first-reference ID being found; and

replace stored SI of the previous-time instance associated with the same first-reference ID with the at least some of the SI of the first-time instance upon a value ID associated with the stored SI of the previous-time instance associated with the same first-reference ID being different from the first-value ID.

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18. The WTRU of claim 17, wherein the processor is further configured to interpret that the value ID associated with the stored SI of the previous-time instance associated with the same first-reference ID being different from the first-value ID corresponds the at least some of the SI of the first-time instance being more current than the stored SI of the previous-time instance.

19. The WTRU of claim 17, wherein the processor is further configured to recognize that the first-reference ID corresponds to at least one of: a first-spatial area, or a first-temporal interval.

20. The WTRU of claim 17, wherein the processor is further configured to determine the first-reference ID by identifying the first-reference ID as communicated from the communication network via at least one of: a broadcast message, or dedicated signaling.

21. The WTRU of claim 20, wherein the processor is further configured to determine the first-value ID by identifying a part of the first-reference ID that represents the first-value ID.

22. The WTRU of claim 20, wherein the processor is further configured to determine the first-value ID by identifying the first-value ID as communicated from the communication network via at least one of: a broadcast message, or dedicated signaling.

23. The WTRU of claim 17, wherein the processor is further configured to determine the first-reference ID by deriving the first-reference ID based on one or more characteristics associated with one or more downlink (DL) transmissions.

24. The WTRU of claim 23, wherein the processor is further configured to determine the first-value ID by identifying the first-value ID as expressly communicated from the communication network via at least one of: a broadcast message, or dedicated signaling.

25. The WTRU of claim 17, wherein the at least some of the SI of the first-time instance is at least one of: essential SI, minimum SI message, or on-demand SI.

26. The WTRU of claim 17, wherein the processor is further configured such that to replace the stored SI of the previous-time instance associated with the same first-reference ID

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Ericsson Inc., Nokia v. Active Wireless Technologies
Page 224

with the at least some of the SI of the first-time instance includes the processor being configured to:

delete from the memory the stored SI of the previous-time instance associated with the same first-reference ID; and

store in the memory the at least some of the SI of the first-time instance.

27. The WTRU of claim 17, wherein the processor is further configured such that to replace the stored SI of the previous-time instance associated with the same first-reference ID with the at least some of the SI of the first-time instance includes the processor being configured to:

overwrite in the memory the stored SI of the previous-time instance associated with the same first-reference ID with the at least some of the SI of the first-time instance.

28. The WTRU of claim 20, wherein the processor is further configured to:

detect that a second-reference ID is being communicated by the communication network in lieu of the first-reference ID;

search the memory for stored SI of a previous-time instance that is associated with the second-reference ID;

utilize the SI of the previous-time instance that is associated with the second-reference ID upon the SI of the previous-time instance that is associated with the second-reference ID being found; and

obtain updated SI from the communication network upon the SI of the previous-time instance that is associated with the second-reference ID not being found.

29. The WTRU of claim 22, wherein the processor is further configured to:

detect that a second-reference ID is being communicated by the communication network in lieu of the first-reference ID;

detect that a second-value ID is being communicated by the communication network in lieu of the first-value ID;

search the memory for stored SI of a previous-time instance that is associated with the second-reference ID and the second-value ID;

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Ericsson Inc., Nokia v. Active Wireless Technologies
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utilize the SI of the previous-time instance that is associated with the second-reference ID and the second-value ID upon the SI of the previous-time instance that is associated with the second-reference ID and second-value ID being found; and

obtain updated SI from the communication network upon the SI of the previous-time instance that is associated with the second-reference ID and the second-value ID not being found.

30. A wireless transmit/receive unit (WTRU) in communication with a communication network, the WTRU comprising:

a memory;

a processor, the processor configured at least to:

determine to request other system information (other-SI) from the communication network;

initiate the request for the other-SI from the communication network as part of a Radom Access Channel (RACH) procedure; and

a transceiver, the transceiver configured at least to:

transmit a RACH signal, the RACH signal including the request for the other-SI in a random access preamble of the RACH signal, the processor being further configured to:

monitor for a message that includes a minimum SI from the communication network for a predetermined period of time following the transmission of the RACH signal;

determine if the requested other-SI is included in the message that includes the minimum SI upon a detection of the message that includes the minimum SI; and

initiate one or more retransmissions of the RACH signal upon at least one of: the message that includes the minimum SI not being detected, or the other-SI is determined to not be included in a detected message that includes the minimum SI.

31. The WTRU of claim 30, wherein the processor is further configured such that the predetermined period of time occurs within a random access response time window.

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32. The WTRU of claim 31, wherein the processor is further configured to monitor for a predefined identifier in a control channel within the random access response time window.

33. The WTRU of claim 32, wherein the processor is further configured such that the predefined identifier is specific to the request of the other-SI.

34. The WTRU of claim 32, wherein the processor is further configured such that the predefined identifier is a Radio Network Temporary Identifier (RNTI).

35. The WTRU of claim 31, wherein the processor is further configured such that the message that includes the minimum SI is at least one of: one or more random access response messages, the processor being further configured to process the at least one of the one or more random access response messages within the random access response time window.

36. The WTRU of claim 35, wherein a format of the at least one of the one or more random access response messages is specific to the request for the other-SI.

37. The WTRU of claim 30, wherein the processor is further configured to initiate a power ramping of the random access preamble in the one or more retransmissions.

38. The WTRU of claim 30, wherein the processor is further configured to initiate the one or more retransmissions of the RACH signal upon at least one of: no response to the RACH signal being detected in the predetermined period of time; or a limit of a preamble counter associated with the RACH signal not being reached.

39. The WTRU of claim 30, wherein the processor is further configured such that the message that includes the minimum SI is at least one of: a random access response message that corresponds to the random access preamble of the RACH signal, or a random access response message that does not correspond to the random access preamble of the RACH signal.

40. The WTRU of claim 30, wherein at least one of the one or more retransmissions have been initiated by the processor, the processor being further configured to:

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cease an initiation of any further retransmissions of the one or more retransmissions upon:

a detection of the message that includes the minimum SI; and

a determination that the requested other-SI is included in the detected message that includes the minimum SI.

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Ericsson Inc., Nokia v. Active Wireless Technologies
Page 228

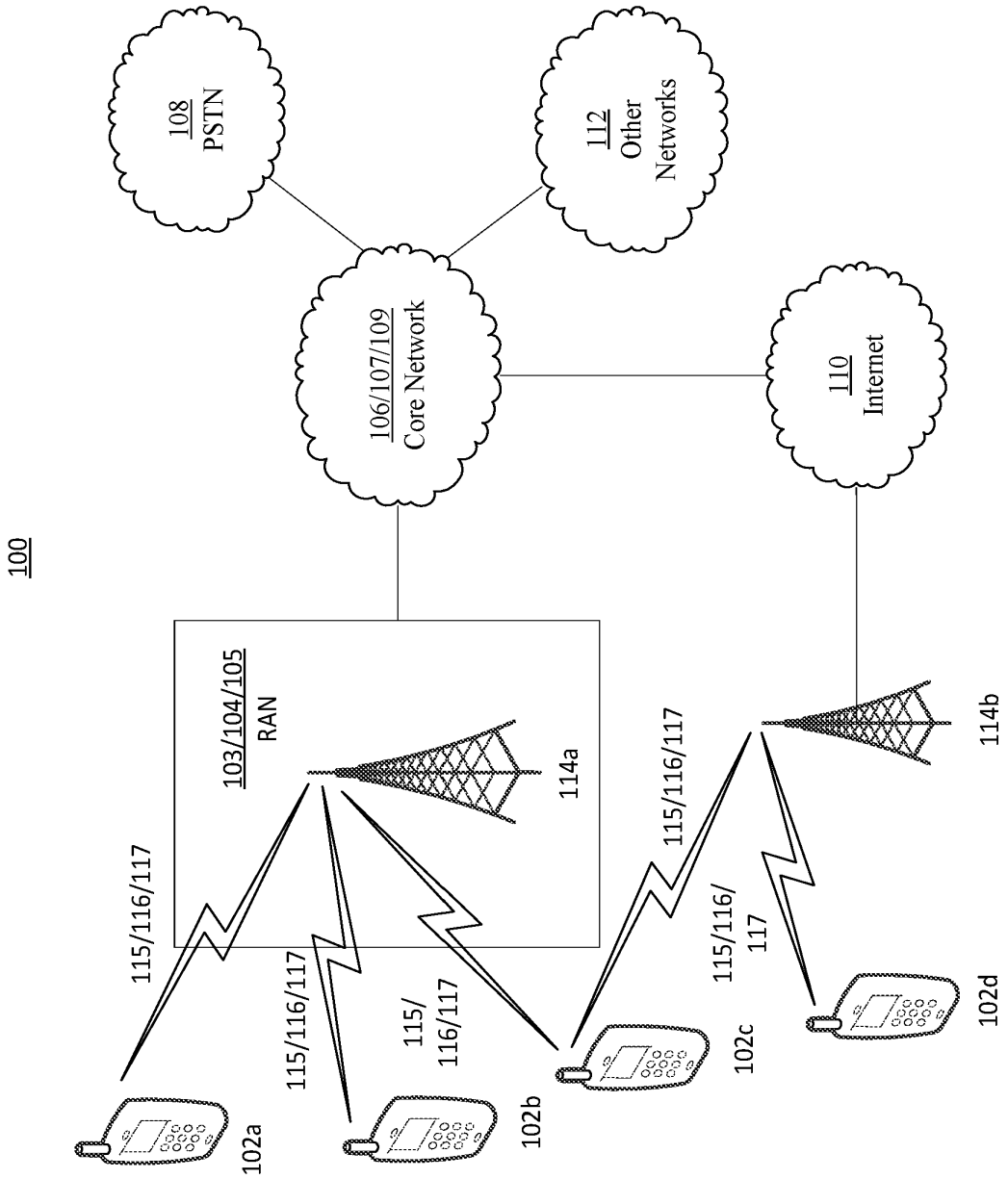

100
108
PSTN
112
Other
Networks
106/107/109
Core Network
110
Internet
103/104/105
RAN
114a
114b
115/116/117
115/116/117
115/
116/117
115/116/117
115/116/
117
102a
102b
102c
102d

FIG. 1A

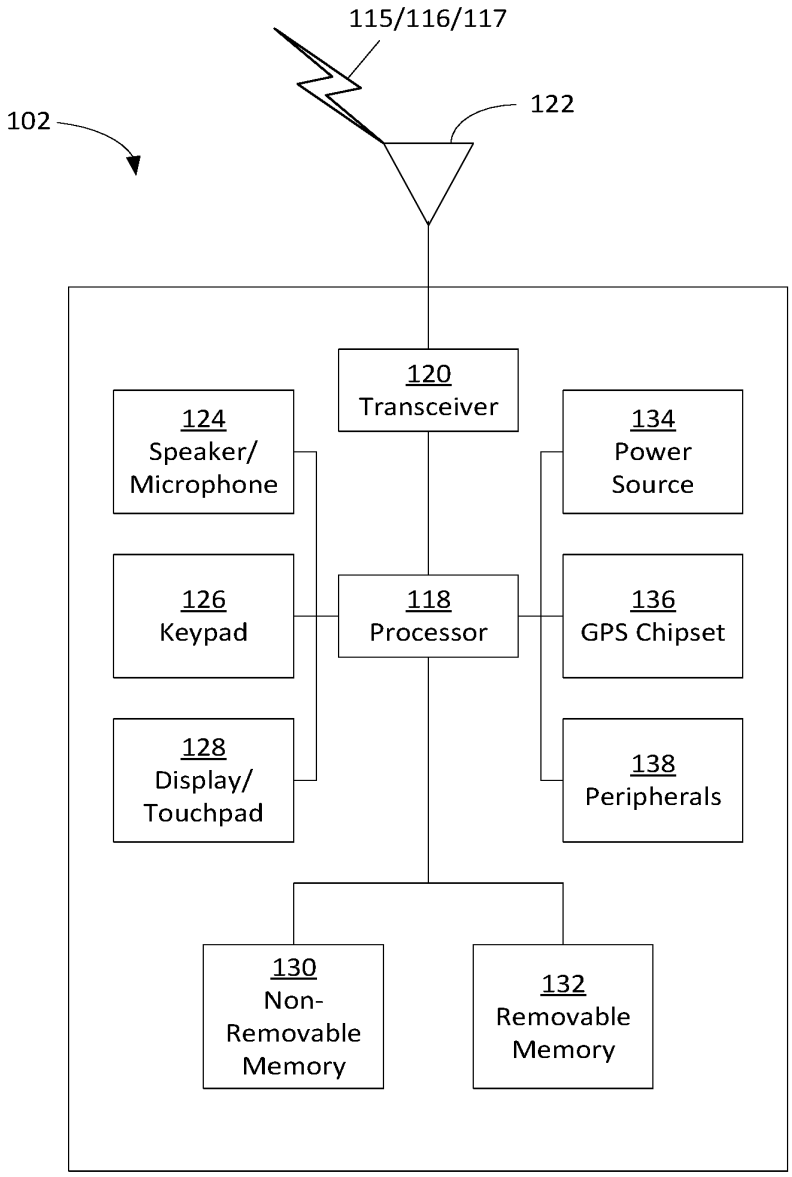

115/116/117
122
102
120
Transceiver
124
Speaker/
Microphone
134
Power
Source
126
Keypad
118
Processor
136
GPS Chipset
128
Display/
Touchpad
138
Peripherals
130
Non-
Removable
Memory
132
Removable
Memory

FIG. 1B

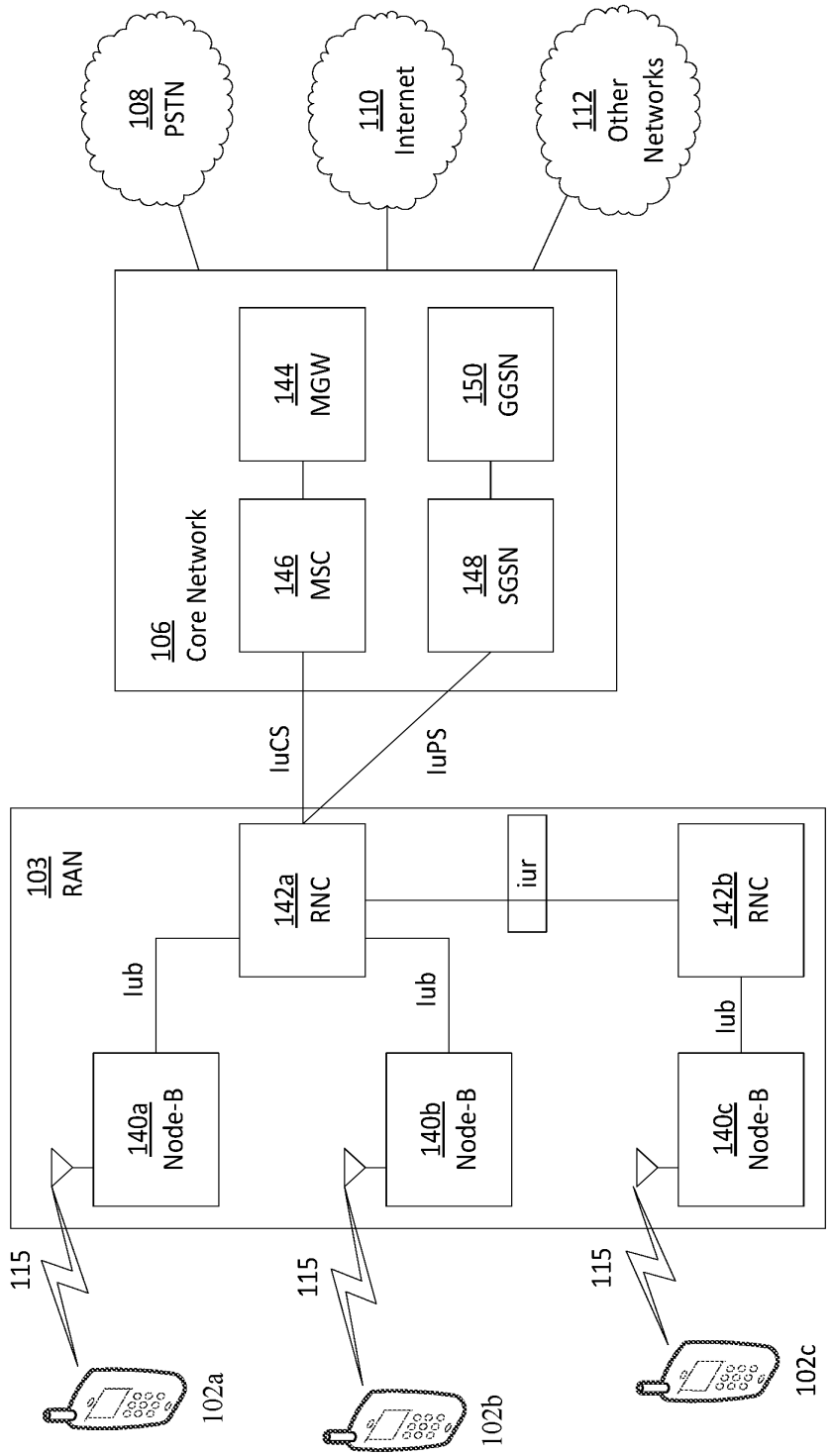

108 PSTN
110 Internet
112 Other Networks
106 Core Network
144 MGW
150 GGSN
146 MSC
148 SGSN
IuCS
IuPS
103 RAN
142a RNC
iur
142b RNC
Iub
Iub
Iub
140a Node-B
140b Node-B
140c Node-B
115
115
115
102a
102b
102c

FIG. 1C

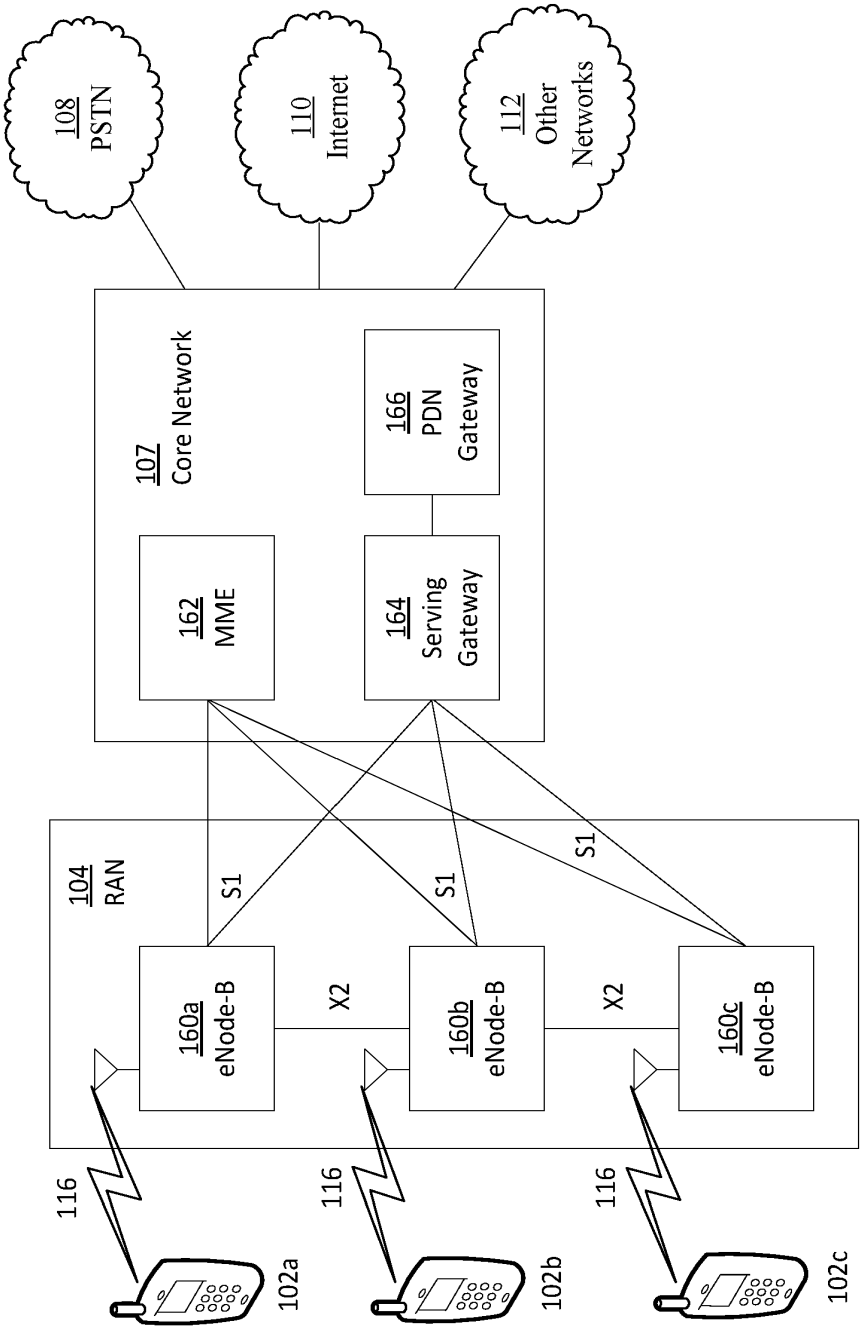

108 PSTN
110 Internet
112 Other Networks
107 Core Network
166 PDN Gateway
162 MME
164 Serving Gateway
104 RAN
S1
S1
S1
160a eNode-B
160b eNode-B
160c eNode-B
X2
X2
116
116
116
102a
102b
102c

FIG. 1D

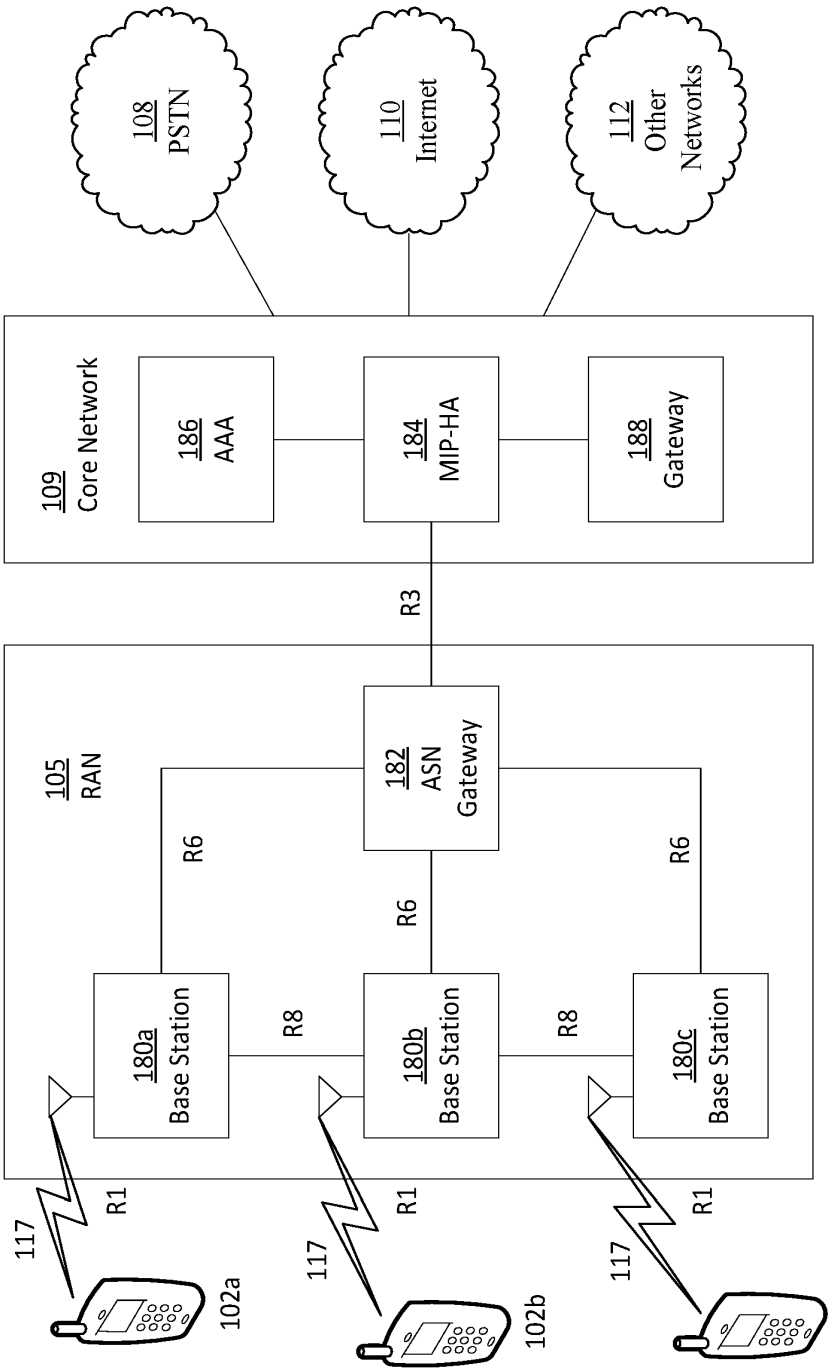

108 PSTN
110 Internet
112 Other Networks
109 Core Network
186 AAA
184 MIP-HA
188 Gateway
R3
105 RAN
182 ASN Gateway
R6
R6
R6
180a Base Station
180b Base Station
180c Base Station
R8
R8
R1
R1
R1
117
117
117
102a
102b
102c

FIG. 1E

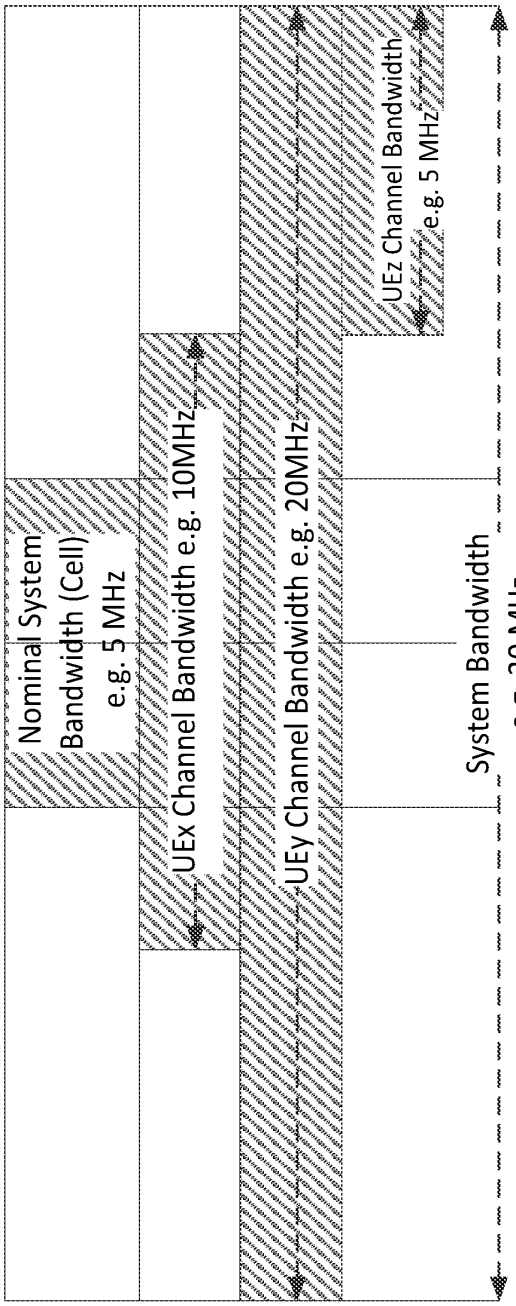

Nominal System Bandwidth (Cell) e.g. 5 MHz
UEx Channel Bandwidth e.g. 10MHz
UEy Channel Bandwidth e.g. 20MHz
UEz Channel Bandwidth e.g. 5 MHz
System Bandwidth e.g. 20 MHz

FIG. 2

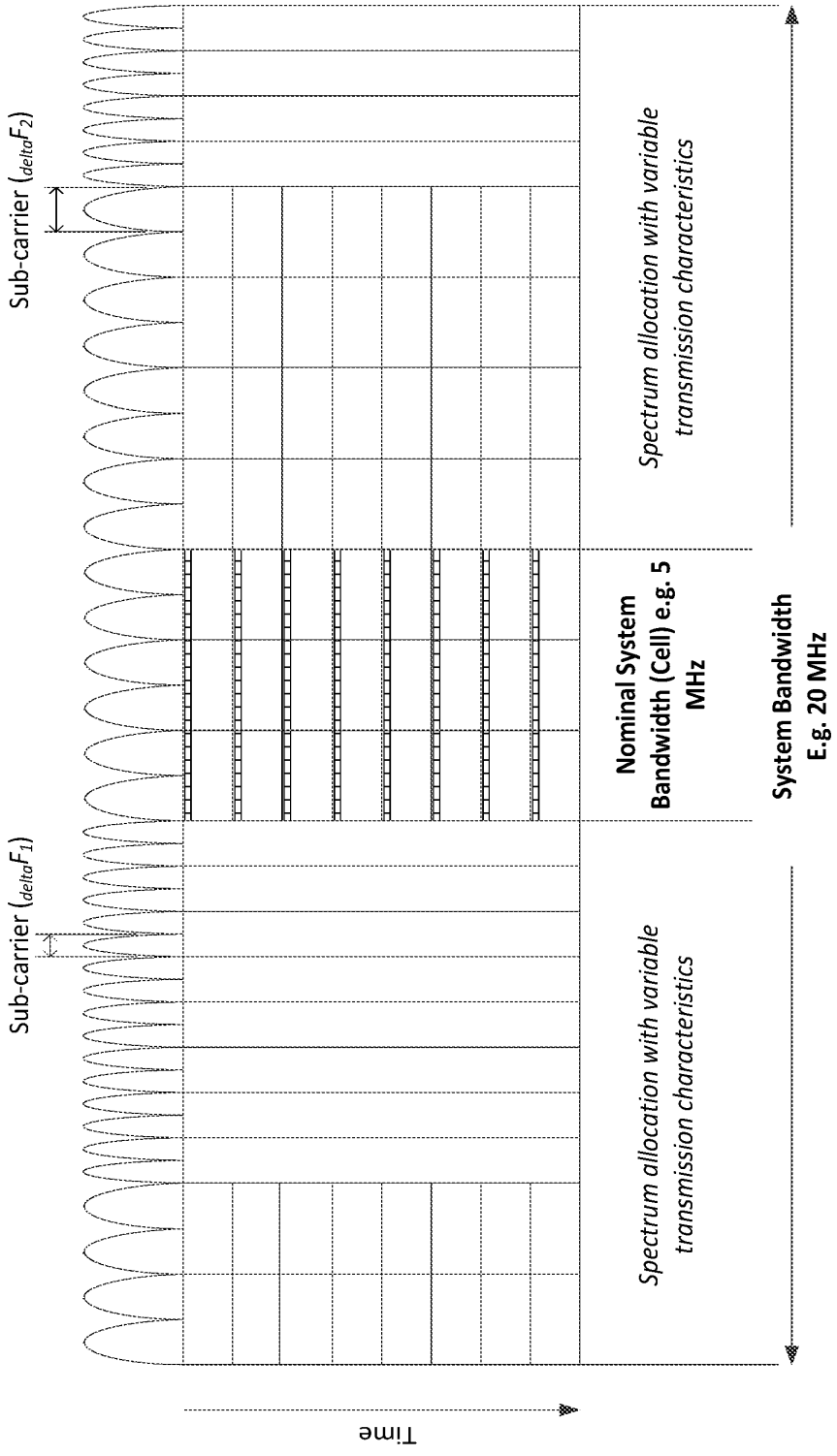

Sub-carrier ($delta F_2$)
Spectrum allocation with variable transmission characteristics
Nominal System Bandwidth (Cell) e.g. 5 MHz
System Bandwidth E.g. 20 MHz
Sub-carrier ($delta F_1$)
Spectrum allocation with variable transmission characteristics
Time

FIG. 3

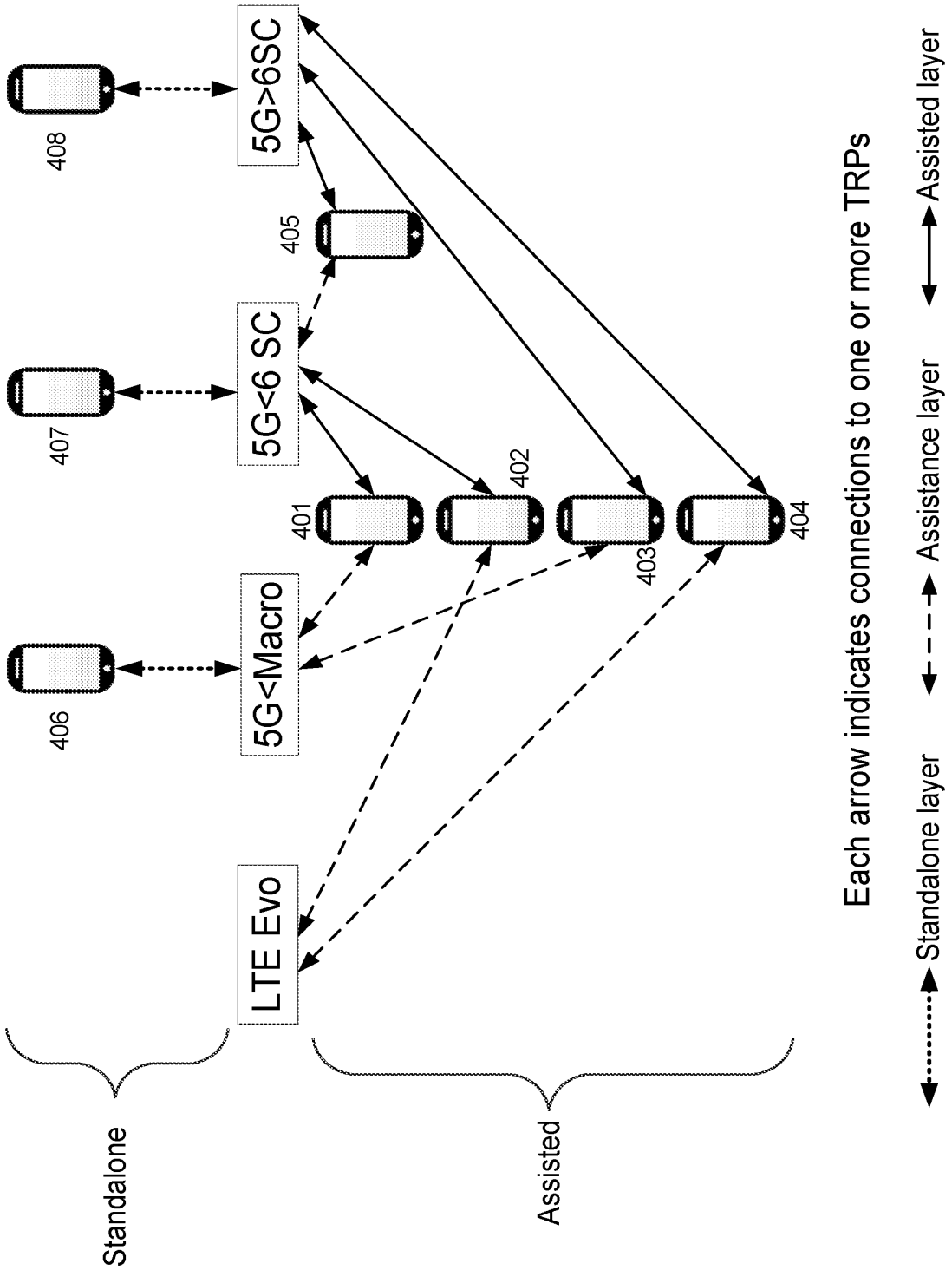

5G>6SC
5G<6 SC
5G<Macro
LTE Evo
401
402
403
404
405
406
407
408
Standalone
Assisted
Each arrow indicates connections to one or more TRPs
Standalone layer
Assistance layer
Assisted layer

FIG. 4

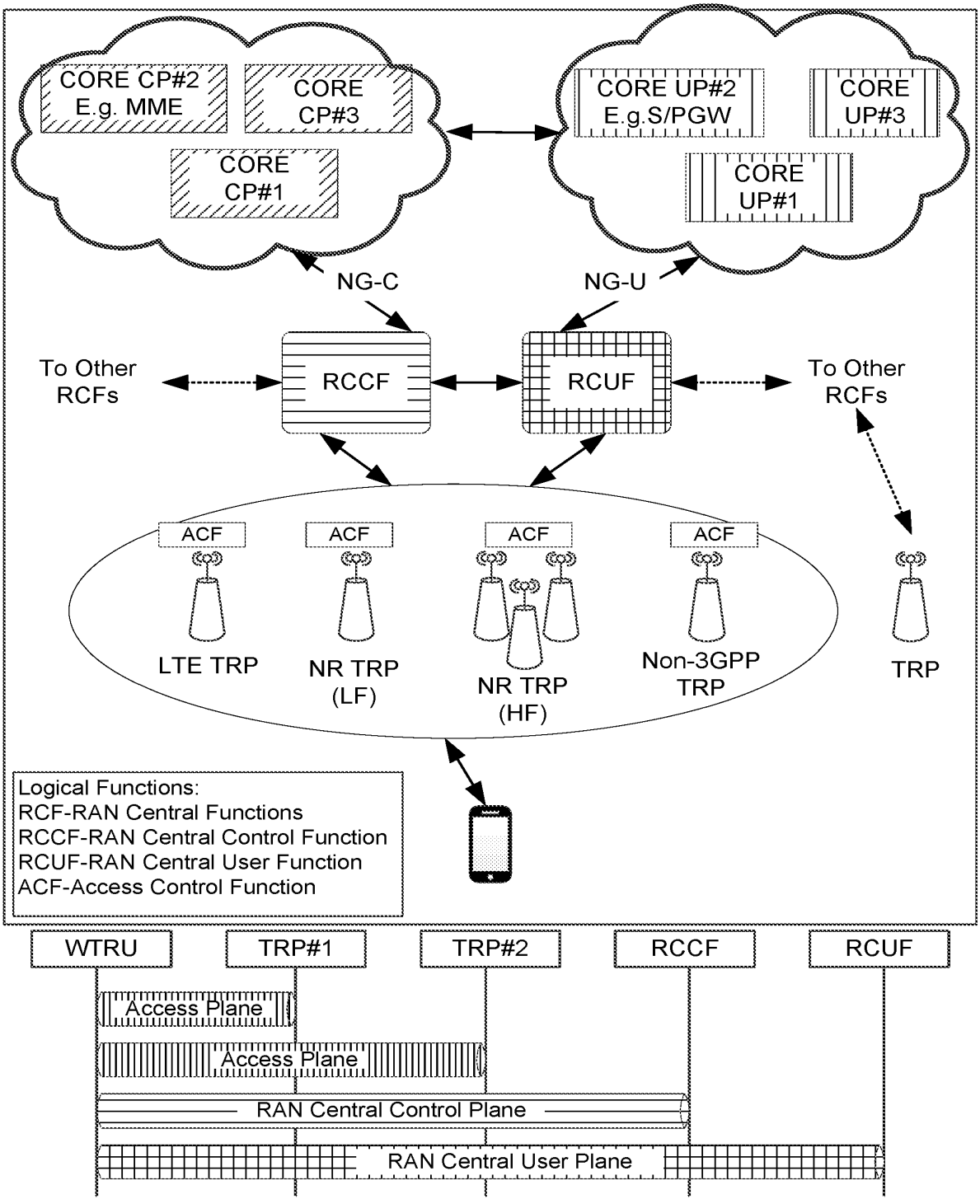

CORE CP#2
E.g. MME
CORE
CP#3
CORE
CP#1
CORE UP#2
E.g.S/PGW
CORE
UP#3
CORE
UP#1
NG-C
NG-U
To Other
RCFs
RCCF
RCUF
To Other
RCFs
ACF
ACF
ACF
ACF
LTE TRP
NR TRP
(LF)
NR TRP
(HF)
Non-3GPP
TRP
TRP
Logical Functions:
RCF-RAN Central Functions
RCCF-RAN Central Control Function
RCUF-RAN Central User Function
ACF-Access Control Function
WTRU
TRP#1
TRP#2
RCCF
RCUF
Access Plane
Access Plane
RAN Central Control Plane
RAN Central User Plane

FIG. 5

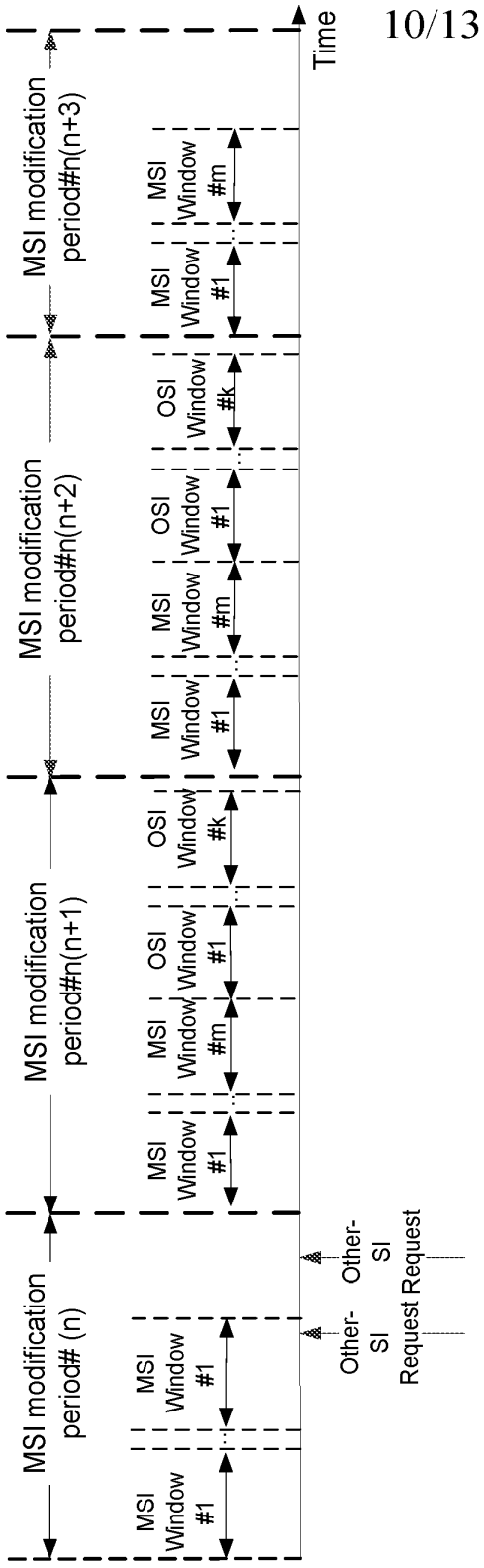

Time
MSI modification period# (n)
MSI modification period#n(n+1)
MSI modification period#n(n+2)
MSI modification period#n(n+3)
MSI Window #1
MSI Window #m
OSI Window #1
OSI Window #k
Other-SI Request

FIG. 6

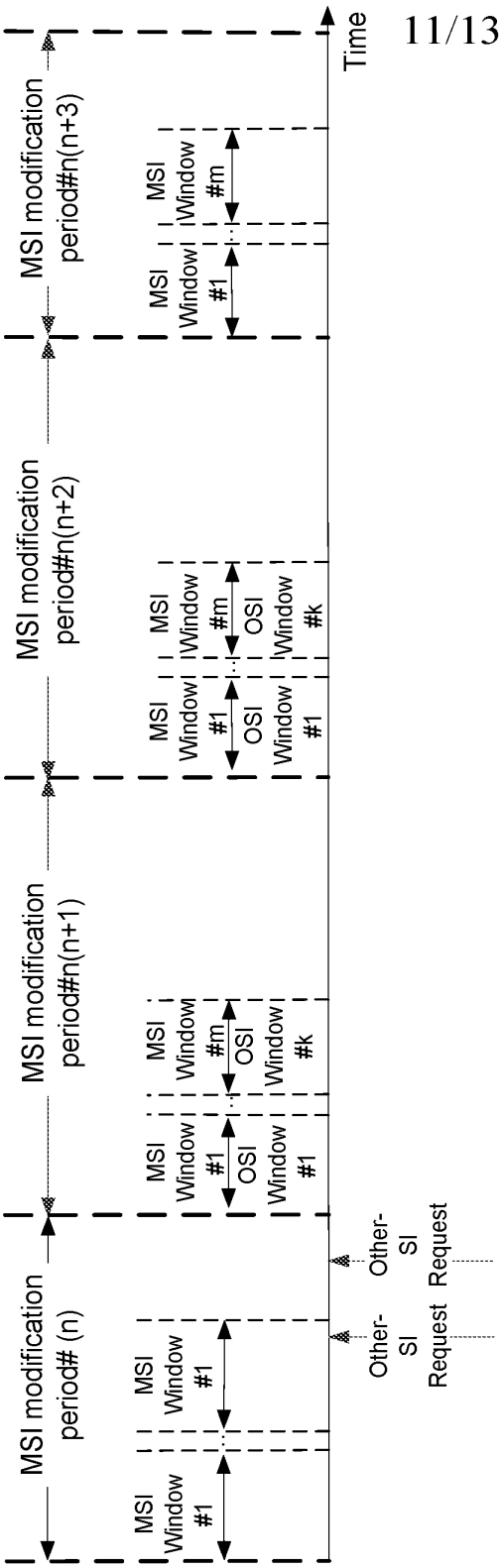

Time
MSI modification period# (n)
MSI modification period#n(n+1)
MSI modification period#n(n+2)
MSI modification period#n(n+3)
MSI Window #1
MSI Window #m
OSI Window #1
OSI Window #k
Other-SI Request

FIG. 7

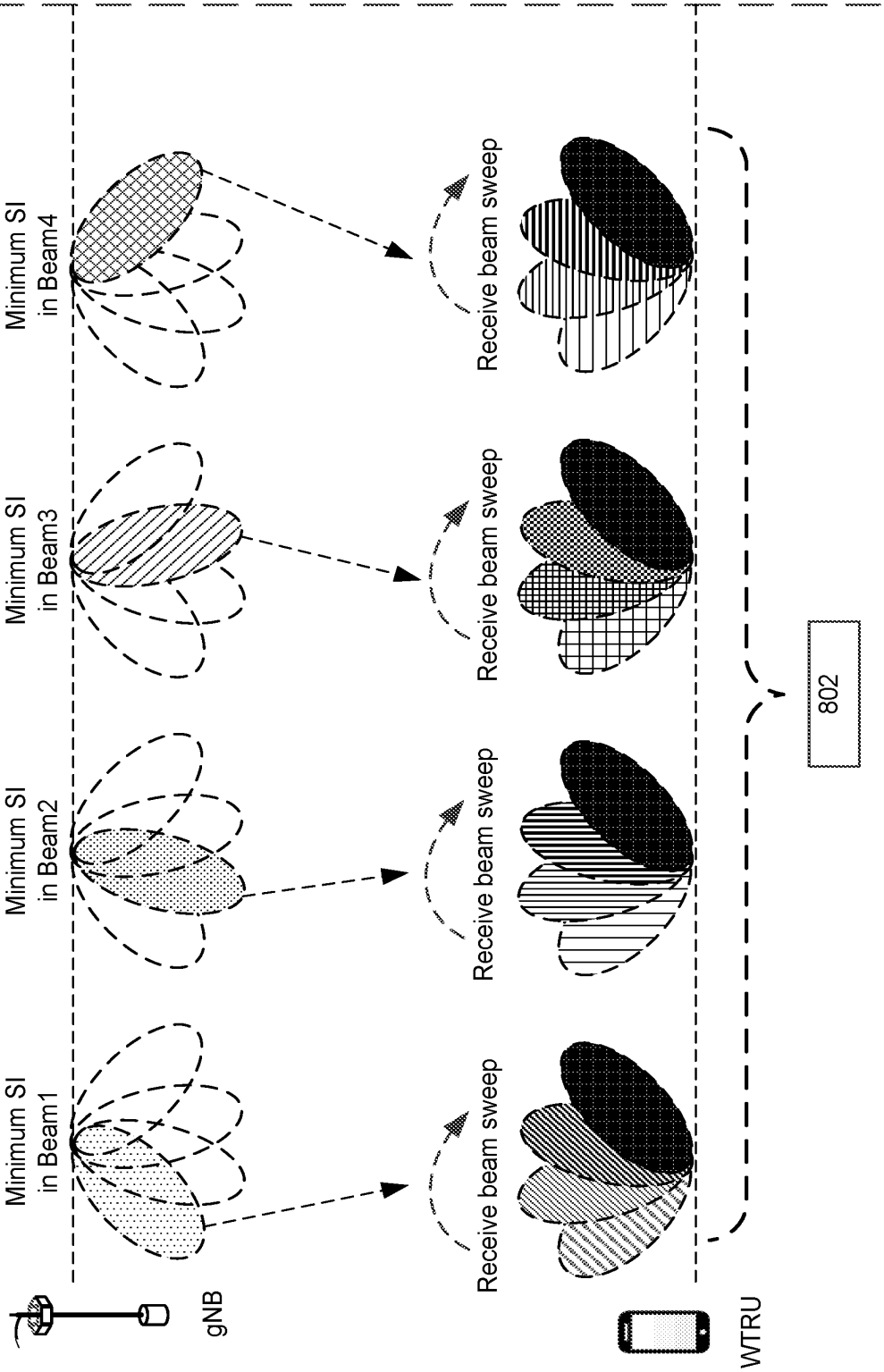

Sync and/or Minimum SI in Beam4
Sync and/or Minimum SI in Beam3
Sync and/or Minimum SI in Beam2
Sync and/or Minimum SI in Beam1
Receive beam sweep
Receive beam sweep
Receive beam sweep
Receive beam sweep
802
gNB
WTRU

FIG. 8A

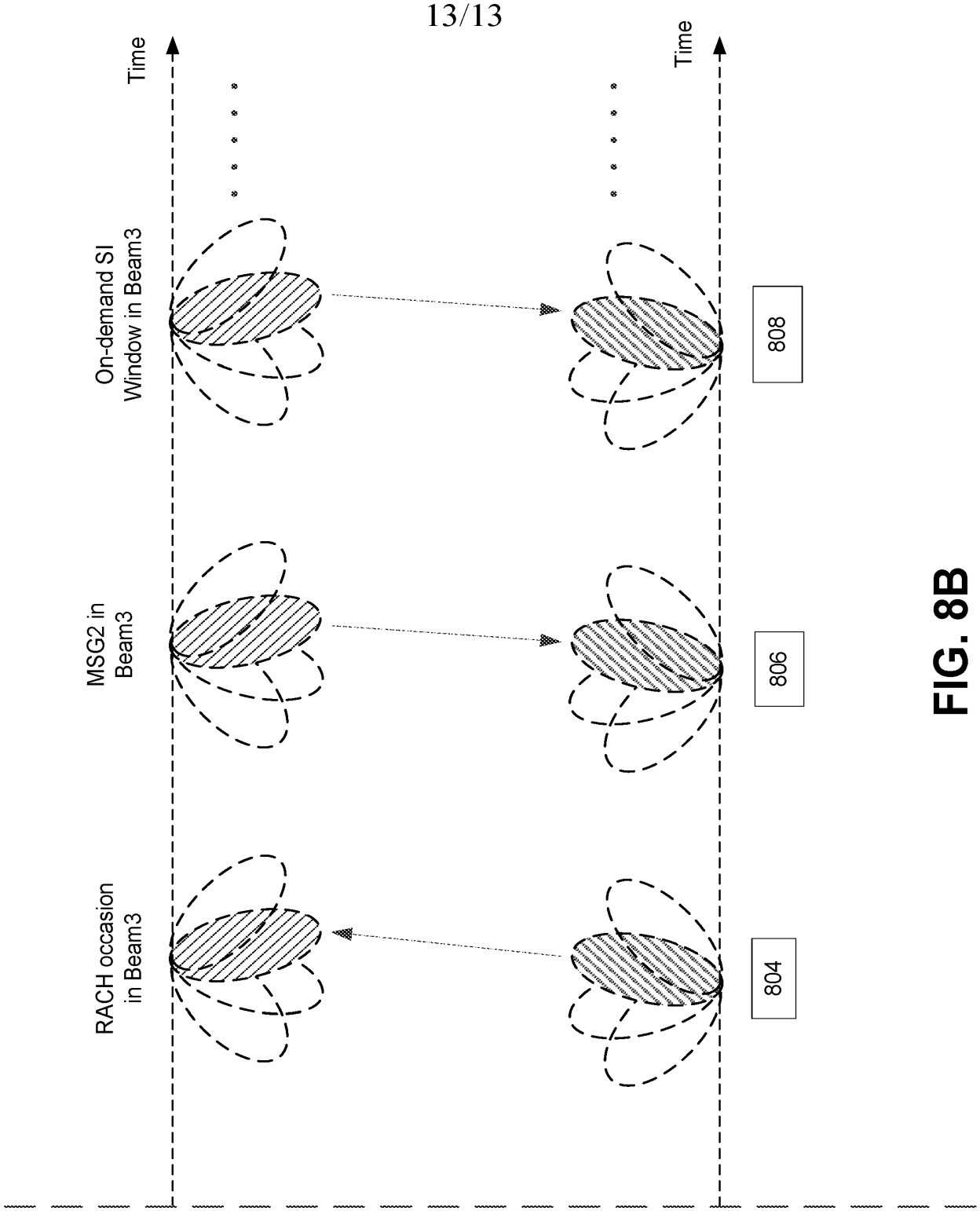

Time
Time
On-demand SI
Window in Beam3
MSG2 in
Beam3
RACH occasion
in Beam3
808
806
804

FIG. 8B

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/032069

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04B7/0408 H04B7/06
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)
H04B

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, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2015/201368 A1 (CUDAK MARK [US] ET AL) 16 July 2015 (2015-07-16) paragraphs [0046], [0151]; figure 3A	1-11
Y	US 2014/112220 A1 (KWAK YONGJUN [KR] ET AL) 24 April 2014 (2014-04-24) paragraphs [0068], [0069]	1-11
A	WO 2013/141541 A1 (LG ELECTRONICS INC [KR]) 26 September 2013 (2013-09-26) the whole document	1-11

☐ 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	Date of mailing of the international search report
10 July 2017	11/09/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Akbudak, Tarik

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2017/032069

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.:

1-11

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: 1-11

Independent claim 1 refers to a wireless transmit/receive unit (WTRU) in communication with a communication network, the WTRU comprising:
- a memory;
- a processor, the processor configured at least to:
  - a) determine to request one or more system information (SI) messages from the communication network; and
  - b) determine if a transmission of the one or more SI message from the communication network will utilize at least one beamformed communication based on one or more communication parameters; and
- a transceiver, the transceiver configured at least to:
  - c) receive at least one of the one or more SI messages from the communication network via the at least one beamformed communication.

---

2. claims: 12-16

Independent claim 12 refers to a wireless transmit/receive unit (WTRU) in communication with a communication network, the WTRU comprising:
- a memory;
- a processor, the processor configured at least to:
  - a) determine to request one or more system information (SI) messages from the communication network;
  - b) conduct a beam sweep operation of one or more downlink (DL) beams transmitted from the communication network;
  - c) identify at least one DL beam of the one or more DL beams via which to receive the one or more on-demand SI messages based at least in part on the beam sweep operation;
  - d) determine one or more uplink (UL) resources with which to communicate information for a WTRU reception of the one or more on-demand SI messages, the information for the WTRU reception including the at least one DL beam; and
  - e) initiate the request for the one or more on-demand SI messages from the communication network; and
- a transceiver, the transceiver configured at least to:
  - f) send the request for the one or more on-demand SI messages to the communication network using the one or more UL resources, the request including the information for the WTRU reception of the one or more on-demand SI messages; and
  - g) receive at least one of the one or more on-demand SI messages from the communication network via the at least one DL beam.

---

3. claims: 17-29

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Independent claim 17 refers to a wireless transmit/receive unit (WTRU) in communication with a communication network, the WTRU comprising:
- a memory;
- a transceiver, the transceiver configured at least to:
  - a) receive system information (SI) from the communication network at a first-time instance; and
- a processor, the processor configured at least to:
  - b) determine a first-reference identifier (ID) that corresponds to at least some of the SI of the first-time instance;
  - c) determine a first-value identifier (ID) that corresponds to the at least some of the SI of the first-time instance;
  - d) associate at least one of: the first-reference ID, or the first-value ID with the at least some of the SI of the first-time instance;
  - e) utilize the at least some of the SI of the first-time instance in communication with the communication network;
  - f) search the memory for stored SI of a previous-time instance that is associated with the same first-reference ID of the at least some of the SI of the first-time instance;
  - g) store the at least some of the SI of the first-time instance upon no stored SI of the previous-time instance associated with the same first-reference ID being found; and
  - h) replace stored SI of the previous-time instance associated with the same first-reference ID with the at least some of the SI of the first-time instance upon a value ID associated with the stored SI of the previous-time instance associated with the same first-reference ID being different from the first-value ID.

---

4. claims: 30-40

Independent claim 30 refers to a wireless transmit/receive unit (WTRU) in communication with a communication network, the WTRU comprising:
- a memory;
- a processor, the processor configured at least to:
  - a) determine to request other system information (other-SI) from the communication network;
  - b) initiate the request for the other-SI from the communication network as part of a Radom Access Channel (RACH) procedure; and
- a transceiver, the transceiver configured at least to:
  - c) transmit a RACH signal, the RACH signal including the request for the other-SI in a random access preamble of the RACH signal, the processor being further configured to:
  - d) monitor for a message that includes a minimum SI from the communication network for a predetermined period of time following the transmission of the RACH signal;
  - e) determine if the requested other-SI is included in the message that includes the minimum SI upon a detection of

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

the message that includes the minimum SI; and

- f) initiate one or more retransmissions of the RACH signal upon at least one of: the message that includes the minimum SI not being detected, or the other-SI is determined to not be included in a detected message that includes the minimum SI.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2017/032069

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2015201368 A1	16-07-2015	CN 104604300 A	06-05-2015
		EP 2870802 A1	13-05-2015
		US 2015201368 A1	16-07-2015
		WO 2014009250 A1	16-01-2014
US 2014112220 A1	24-04-2014	US 2014112220 A1	24-04-2014
		WO 2014065600 A1	01-05-2014
WO 2013141541 A1	26-09-2013	US 2015016419 A1	15-01-2015
		US 2015043367 A1	12-02-2015
		US 2015055495 A1	26-02-2015
		WO 2013141541 A1	26-09-2013
		WO 2013141542 A1	26-09-2013
		WO 2013141543 A1	26-09-2013

Form PCT/ISA/210 (patent family annex) (April 2005)

JUL 25 2019 PM12:27

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: H. WARREN BURNAM JR.
NIXON & VANDERHYE P.C.
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203-1808

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)* 23 JUL 2019
Applicant's or agent's file reference SLA3814.PCT_HWB-6112-0173	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US2019/031674	International filing date *(day/month/year)* 10 May 2019
Applicant SHARP LABORATORIES OF AMERICA, INC.	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

   How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
   ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
   ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

   Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

   Within **22 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine R. Copenheaver Telephone No. PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/220 (July 2017)

JUL 25 2019 PM12:04

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: H. WARREN BURNAM JR.
NIXON & VANDERHYE P.C.
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203-1808

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)*
Applicant's or agent's file reference SLA3814.PCT_HWB-6112-0173	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US2019/031674	International filing date *(day/month/year)* 10 May 2019
Applicant SHARP LABORATORIES OF AMERICA, INC.	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

   How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
   - ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
   - ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

   Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

   Within **22 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 Telephone No. PCT OSP: 571-272-7774

Form PCT/ISA/220 (July 2017)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference SLA3814.PCT_HWB-6112-0173	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US2019/031674	International filing date *(day/month/year)* 10 May 2019	(Earliest) Priority Date *(day/month/year)* 10 May 2018
Applicant SHARP LABORATORIES OF AMERICA, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 9 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of:

   ☒ 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 (Rules 12.3(a) and 23.1(b)).

   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

   ☒ the text is approved as submitted by the applicant.

   ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

   ☒ the text is approved as submitted by the applicant.

   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

   a. the figure of the **drawings** to be published with the abstract is Figure No. 1

   ☐ as suggested by the applicant.

   ☒ as selected by this Authority, because the applicant failed to suggest a figure.

   ☐ as selected by this Authority, because this figure better characterizes the invention.

   b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/031674

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.01)
CPC - H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.05)

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)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 370/329; 370/328; 370/331 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2017/0064764 A1 (QUALCOMM INCORPORATED) 02 March 2017 (02.03.2017) entire document	1-8
A	US 2017/0251500 A1 (SAMSUNG ELECTRONICS CO., LTD.) 31 August 2017 (31.08.2017) entire document	1-8
A	WO 2017/197063 A1 (IDAC HOLDINGS, INC.) 16 November 2017 (16.11.2017) entire document	1-8
A	US 2015/0038142 A1 (BROADCOM CORPORATION) 05 February 2015 (05.02.2015) entire document	1-8
A	US 2014/0086173 A1 (INTERDIGITAL PATENT HOLDINGS, INC.) 27 March 2014 (27.03.2014) entire document	1-8
A	US 2015/0215757 A1 (MISKIEWICZ et al) 30 July 2015 (30.07.2015) entire document	1-8
A	US 2017/0325049 A1 (PANASONIC INTELLECTUAL PROPERTY CORPORATION OF AMERICA) 09 November 2017 (09.11.2017) entire document	1-8
A	US 2010/0323714 A1 (SCHMIDT et al) 23 December 2010 (23.12.2010) entire document	1-8

☐ 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	Date of mailing of the international search report
08 July 2019	23 JUL 2019
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: H. WARREN BURNAM JR.
NIXON & VANDERHYE P.C.
901 NORTH GLEBE ROAD, 11TH FLOOR
ARLINGTON, VA 22203-1808

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	23 JUL 2019
Applicant's or agent's file reference SLA3814.PCT_HWB-6112-0173	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2019/031674	10 May 2019	10 May 2018

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.01)
CPC - H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.05)

Applicant SHARP LABORATORIES OF AMERICA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ 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 Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and 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

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	08 July 2019	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (January 2015)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2019/031674

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ 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 (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2019/031674

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-8	YES
	Claims	None	NO
Inventive step (IS)	Claims	1-8	YES
	Claims	None	NO
Industrial applicability (IA)	Claims	1-8	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1-8 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest:

Regarding claims 1, 3 the prior art of record, individually or in combination, does not teach or fairly suggest to initiate a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising: scheduling information of a second type SI message, the second type SI message comprising at least one system information block (SIB); and an indication of broadcast status for the second type SI message, the indication indicating broadcasting; to receive the first type SIB; and to initiate an SI message acquisition process to receive the SI message; wherein in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

Regarding claims 5, 7 the prior art of record, individually or in combination, does not teach or fairly suggest to transmit first type system information block (SIB), the first type SIB comprising: scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; an indication of broadcast status for the SI message, the indication indicating broadcasting; to broadcast the SI message; wherein the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid.

The prior art teaches some of the concepts and/or aspects of the claim limitations as shown below, but does not teach the claim limitations in their entirety and as specifically recited in each of the claims:

Qualcomm Incorporated (US 2017/0064764 A1) teaches user equipment communicating over a radio interface with a base station of a radio access network (A wireless communication network may include a number of base stations that can support communication for a number of user equipments, para.0006; wireless networks implementing radio technologies, para.0021), initiate a first type system information block acquisition process to receive a first type SIB (concurrent SIB decoding during initial SIB1 acquisition, para.0060; combining multiple transmissions of at least a first type of system information block (SIB) message across different system information (SI) message windows and a second buffer for combining multiple transmissions of at least a second type of SIB message within an SI window. At 604, the apparatus decodes at least the first and second types of SIB messages based on contents in the first and second buffers, para.0058), scheduling information of a SI message comprising at least one system information block (a particular SIB may be transmitted within an SI message. A UE may attempt to acquire the SIB by listening starting from the beginning of the SI window for SI messages including the SIB until the SIB is acquired, para.0053; The SI window may be defined to enable retransmission of the SI message within the SI window, para.0054), an indication of broadcast status, the indication indicating broadcasting (SIB messages include broadcast information (e.g., critical broadcast information) and decoded information carried in various SIB messages is required for initial attach, handover, cell reselection, and monitoring for critical information, para.0050), receive the first type SIB (concurrent SIB decoding during initial SIB1 acquisition, para.0060; combining multiple transmissions of at least a first type of system information block (SIB) message across different system information (SI) message windows, para.0058).
However, Qualcomm Incorporated does not explicitly teach a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising: scheduling information of a second type SI message, the second type SI message comprising at least one system information block (SIB); and an indication of broadcast status for the second type SI message, the indication indicating broadcasting; to broadcast and receive SI message; wherein in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process and wherein the first type SIB is re-acquired by the user equipment.

IDAC Holdings, Inc. (WO 2017/197063 A1) teaches user equipment communicating over a radio interface with a base station of a radio access network (The communications system 100 may include a base station 114a and a base station 114b. Each of the base stations 114a, 114b may be any type of device configured to wirelessly interface with at least one of the WTRUs 102a, 102b, 102c, 102d to facilitate access to one or more communication networks, para.0026; communication system include a radio access network, para.0026), initiate a system information block acquisition process (a WTRU may transmit a reserved RACH preamble to request system information. For example, such reserved RACH preambles may be used to indicate a specific system information block, para.0276; The SIB numbering may further be based on the SIBs that the cell has available, para.0313), scheduling information of a system information (SI) message (a WTRU may determine the presence of other-SI based on scheduling information in the essential SI. For example, a WTRU may trigger other-SI request if a WTRU may determine that the broadcast of other-SI is stopped before the WTRU can acquire the required other-SI and/or if a WTRU determines that one or more specific other-SI required by the WTRU is not present in the current schedule of other-SI broadcast, para.0269), an indication of broadcast status for the SI message, the indication indicating broadcast (A WTRU may receive the signaling indicating whether the modified other-SI is broadcasted, para.0273; a WTRU receives the response in

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

msg2, with indication that the requested system information will be broadcasted, para.0283).
However, IDAC Holdings, Inc. does not explicitly teach a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising: scheduling information of a second type SI message, the second type SI message comprising at least one system information block (SIB); and an indication of broadcast status for the second type SI message, the indication indicating broadcasting; to broadcast and receive SI message; wherein in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process and wherein the first type SIB is re-acquired by the user equipment.

Samsung Electronics Co., Ltd. (US 2017/0251500 A1) teaches user equipment communicating over a radio interface with a base station of a radio access network (transmitting system information (SI) to user equipment by a base station (BS) in a wireless communication system, para.0017; using radio access technology for communications, para.0009), initiate a first type system information block (SIB) acquisition process to receive a first type SIB (minimum SI or essential SI may include a separate indication for each SI (e.g. system information block (SIB)) or set of SIs (i.e. SIBs) wherein each indication indicates whether the associated SI or set of SIs are periodically broadcasted or are provided on demand, para.0052; first type SI associated with SI which is essential for communication with the BS, para.0016), scheduling information of a system information (SI) message (minimum SI or essential SI may include a separate indication for each SI message wherein each SI message carries one or more SIs (i.e. SIBs), para.0053), a second type SI message (second type SI associated with at least one SI which the UE needs, para.016), an indication of broadcast status for the SI message, the indication indicating broadcast (The indication associated with an SI message indicates whether SIs associated with that SI message are broadcasted, para.0053).
However, Samsung Electronics Co., Ltd. does not explicitly teach a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising: scheduling information of a second type SI message, the second type SI message comprising at least one system information block (SIB); and an indication of broadcast status for the second type SI message, the indication indicating broadcasting; to broadcast and receive SI message; wherein in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process and wherein the first type SIB is re-acquired by the user equipment.

Additional references which are of related interest to the instant invention include:
Broadcom Corporation (US 2015/0038142 A1)
Interdigital Patent Holdings, Inc. (US 2014/0086173 A1)
Miskiewicz et al. (US 2015/0215757 A1)
Panasonic Intellectual Property Corporation of America (US 2017/0325049 A1)
Schmidt et al (US 2010/0323714 A1)

None of these references whether taken singly or in combination explicitly teach or suggest a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising: scheduling information of a second type SI message, the second type SI message comprising at least one system information block (SIB); and an indication of broadcast status for the second type SI message, the indication indicating broadcasting; to broadcast and receive SI message; wherein in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process and wherein the first type SIB is re-acquired by the user equipment.

Regarding claims 2, 4, 6, 8, each claim depends from base claims 1, 3, 5, 7 respectively and therefore meet the criteria set out in PCT Article 33(2)-(3), for at least the same reasons as base claims 1, 3, 5, 7.

Claims 1-8 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Search History:

Limited Classification Search

The Patent Analyst performed a limited classification search within the following US, IPC, CPC, ECLA, or F-Term classification areas:

CPC Class/Subclass(es): H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.05)

IPC (8) Class/Subclass(es): H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.01)

U.S. Class/Subclass(es): 370/329; 370/328; 370/331

See Global Search Results.

Global Patent Literature Text Search

The Patent Analyst performed the following global text search, which was not limited by classification but may or may not have been limited by other criteria:

Minesoft PatBase: https//www.patbase.com

#	Search query	Results
1	PA=(SHARP LABORATORIES OF AMERICA, INC.)	2132
2	FT=((radio w2 network) AND (base w2 station*) AND ((system w2 information) w2 block) AND (first w2 type) AND (second w2 type) AND status AND broadcast*) and PA=(SHARP LABORATORIES OF AMERICA, INC.)	4
3	FT=((radio w2 network) AND (base w2 station*) AND ((system w2 information) w2 block) AND (first w2 type) AND (second w2 type) AND status AND broadcast*)	331
4	FT=((radio w2 network) AND (base w2 station*) AND ((system w2 information) w2 block) AND (first w2 type) AND (second w2 type) AND status AND broadcast* AND (SI w2 message*) AND request* AND fail*)	15
5	FT=((radio w2 network) AND (base w2 station*) AND ((system w2 information) w2 block) AND (first w2 type) AND (second w2 type) AND status AND broadcast* AND (SI w2 message*) AND request* AND fail* AND valid*)	10
6	PN=(US2017064764 OR WO17197063 OR US2017251500 OR US2015038142)	4
7	IC=(H04W48/10)	3805
8	3 AND 7	26
9	IC=(H04W4/06)	16803
10	3 AND 9	14
11	IC=(H04W48/12)	3573
12	3 AND 11	25
13	IC=(H04W16/14)	8599
14	3 AND 13	19

15	CPC=(H04W48/10)	2513
16	3 AND 15	20
17	CPC=(H04W4/06)	8056
18	3 AND 17	12
19	CPC=(H04W48/12)	3512
20	3 AND 19	26
21	CPC=(H04W16/14)	6458
22	3 AND 21	16
23	UC=(370/329)	26941
24	3 AND 23	118
25	UC=(370/328)	15360
26	3 AND 25	30
27	UC=(370/331)	9045
28	3 AND 27	23

Google Patents: https://patents.google.com

#	Search query	Results
1	(APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATIONS)	100+
2	"system information broadcast" "SI message" "first type" "second type" "base station" "radio access network"	4
3	"SIB" "SI message" "first type" "second type" "base station" "radio"	14
4	"first type SIB" "second type SIB" "request" "message"	3
5	"system information block" "scheduling information" "request" "message" "first type" "second type"	100+
6	"system information block" "scheduling information" "request" "message" "first type" "second type" "broadcast" "valid"	100+
7	(in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process)	100+
8	(the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid)	100+
9	(in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process) "first type" "second type" "SIB"	37
10	(the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition	100+

	process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid) "SIB"	
11	"SIB" "first type" "second type" "SI message"	14
12	(radio access network) (system information block) (first type SIB) (second type SIB) (scheduling information) (SI request message) (broadcast) (on-demand delivery) (valid) (failure)	100+
13	(radio access network) (system information block) (first type SIB) (second type SIB) (scheduling information) (SI request message) (broadcast) (valid) (failure)	100+
14	"system information broadcast" "SI message" "first type" "second type" "base station" "request" "valid"	2
15	"SIB" "first type" "second type" "SI message"	14
16	"SIB" "first type" "second type" "SI message" "indication" "broadcast"	13
17	"SIB" "first type" "second type" "SI message" "indication" "broadcast status"	0

Computer Accessed Text Databases Searched

The Patent Analyst searched the following computer accessed text databases:

Google Scholar: https://scholar.google.com/

#	Search query	Results
1	(APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATIONS)	100+
2	"system information broadcast" "SI message" "first type" "second type" "base station" "radio access network"	0
3	"system information broadcast" "SI message" "first type" "second type" "base station" "request" "valid"	0
4	"SIB" "SI message" "first type" "second type" "base station" "radio"	0
5	"first type SIB" "second type SIB" "request" "message"	0
6	"system information block" "scheduling information" "request" "message" "first type" "second type"	2
7	"system information block" "scheduling information" "request" "message" "first type" "second type" "broadcast" "valid"	2
8	(in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process)	100+
9	(the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid)	44
10	(in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process) "first type" "second type" "SIB"	44

11	(the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid) "SIB"	44
12	"SIB" "first type" "second type" "SI message"	0
13	(radio access network) (system information block) (first type SIB) (second type SIB) (scheduling information) (SI request message) (broadcast) (on-demand delivery) (valid) (failure)	32
14	(radio access network) (system information block) (first type SIB) (second type SIB) (scheduling information) (SI request message) (broadcast) (valid) (failure)	100+
15	"SIB" "first type" "second type" "SI message"	0
16	"SIB" "first type" "second type" "SI message" "indication" "broadcast"	0
17	"SIB" "first type" "second type" "SI message" "indication" "broadcast status"	0

Date search was completed: 08 July 2019

AK/MP

Electronic Acknowledgement Receipt

EFS ID:	36739285
Application Number:	16408922
International Application Number:	
Confirmation Number:	1156
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Customer Number:	126613
Filer:	H. Warren Burnam
Filer Authorized By:	
Attorney Docket Number:	SLA3814_1_6112-0174
Receipt Date:	02-AUG-2019
Filing Date:	10-MAY-2019
Time Stamp:	08:22:43
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		SLA3814_1_6112-0174_IDS_1449_submitting_ISR_WO.pdf	122594 c7d25acc9dea9f6022e05fda975df37732be55cc	yes	3

	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Transmittal Letter		1	2	
	Information Disclosure Statement (IDS) Form (SB08)		3	3	
Warnings:					
Information:					
2	Foreign Reference	WO2017197063A1.pdf	6793735 a162a0e84f6c621b33d2a93effb521596a376e67	no	128
Warnings:					
Information:					
3	Non Patent Literature	SLA3942P_6112-0190_ISR_WO.pdf	8795360 2477407e8df7f53728207eef966526cb2d5d8a53	no	12
Warnings:					
Information:					
		Total Files Size (in bytes):	15711689		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	Conf. No.: 1156
ISHII	Atty. Dkt. No.: SLA3814_1_6112-0174
Appln. No. 16/408,922	Art Unit: 2642
Filed: May 10, 2019	Examiner: To Be Assigned

For: APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION

* * * * * * * * * * * *

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Date: July 31, 2019

INFORMATION DISCLOSURE STATEMENT

Sir:

As suggested by 37 C.F.R. 1.97, the undersigned attorney brings to the attention of the Patent and Trademark Office the references listed on the attached form PTO-1449.

☐ All listed documents are attached.

☒ Copies of U.S. Patent Publications are not required and are not attached.

☒ Listed foreign patent publications and other documents are enclosed.

☐ The English translation is a machine translation provided by the Industrial Property Digital Library (IPDL) of the Japan Patent Office (JPO).

☐ The partial translations were provided to the undersigned by the applicants' foreign representative. The undersigned has no knowledge regarding the pertinency of the partially translated portions vis-á-vis the document as a whole. The partial translations are merely provided for whatever convenience they may be.

☐ The listed documents were cited in the ISR and copies should have been supplied by WIPO directly to the US PTO. If copies are not timely received from WIPO, please telephone the undersigned so that copies can be timely supplied for the Examiner's consideration in this US National Phase Application.

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Ericsson Inc., Nokia v. Active Wireless Technologies
Page 262

This is not to be construed as a representation that a search has been made or that no better prior art exists, or that a reference is relevant merely because cited.

The Examiner is requested to initial the attached form PTO-1449 and to return a copy of the initialed document to the undersigned as an indication that the attached references have been considered and made of record.

The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

Respectfully submitted,
NIXON & VANDERHYE P.C.

By: /H. Warren Burnam, Jr./
H. Warren Burnam, Jr.
Reg. No. 29,366

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/408,922	05/10/2019	Atsushi ISHII	SLA3814_1_6112-0174	1156

126613 7590 08/21/2019

NIXON & VANDERHYE, P.C. / SLA
901 N. Glebe Road, 11th Floor
Arlington, VA 22203

EXAMINER	
VIANA DI PRISCO, GERMAN	

ART UNIT	PAPER NUMBER
2642	

NOTIFICATION DATE	DELIVERY MODE
08/21/2019	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PTOMAIL@nixonvan.com
pair_nixon@firsttofile.com

Office Action Summary	**Application No.** 16/408,922	**Applicant(s)** ISHII, Atsushi	
	Examiner GERMAN VIANA DI PRISCO	**Art Unit** 2642	**AIA (FITF) Status** Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 5/10/2019.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-8 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-8 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 5/10/2019 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Priority

Applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) or under 35 U.S.C. 120, 121, 365(c), or 386(c) is acknowledged.

Information Disclosure Statement

The information disclosure statements (IDS) submitted on 5/10/2019 and 8/2/2019 are being considered by the Examiner.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1 recites the limitation "the at least one second type SIB" in line 12. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-8 are rejected under 35 U.S.C. 103 as being unpatentable over Johansson et al (Pub. No.: US 2018/0049107 A1, hereinafter Johansson) in view of Jha et al (Pub. No.: US 2018/0124685 A1, hereinafter Jha), and further in view of R2-1805017, 3GPP TSG-RAN2 101bis, Intel Corporation, "Remaining issues on on-demand System Information", Sanya, China, April 16-20, 2018, hereinafter R2-1805017.

Consider claims 1 and 3, Johansson discloses a method and a user equipment (user equipment UE 201, see Fig. 2 and paragraph 26) that communicates over a radio interface with a base station apparatus (base station eNodeB 202 see Fig. 2 and paragraph 26) of a radio access network (RAN), the user equipment comprising:

processor circuitry configured to initiate a first type system information block (SIB) acquisition process to receive (an SI acquisition circuit 216 that performs system

information acquisition, see Fig. 2 and paragraph 27) a first type SIB (minimum SI, paragraph 29), the first type SIB comprising:

scheduling information of a second type SI message, the second type SI message comprising at least one system information block (SIB) (the minimum SI comprises the MIB and an SI list containing information for acquiring any other SI, paragraph 29); and

an indication of broadcast status for the second type SI message, the indication indicating broadcasting (For example, the SI list indicates that SIB1-SIB3 are scheduled to be broadcasted with corresponding scheduling information, and SIB4-SIB11 will not be broadcasted periodically, paragraph 30);

receiver circuitry configured to receive the first type SIB (transceiver 213, Fig. 2); and

the processor circuitry further configured to initiate an SI message acquisition process to receive the SI message (As a result, the UE will acquire SIB1-SIB3 via broadcasting reception, and will acquire SIB-SIB11 via on-demand requesting, paragraph 30);

However, Johansson does not expressly disclose wherein in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

In the same field of endeavor Jha discloses a case that a stored version of one of the at least one second type SIB is not valid (receive, at the UE from the eNodeB, one or more system information (SI) change notifications that indicate a change has occurred in one or more system information blocks (SIBs) with respect to a previous

version of the one or more SIBs; receive, at the UE, a SIB1 that is broadcast from the eNodeB, wherein the SIB1 is associated with a value tag and the SIB1 includes a bitmap that indicates which of the one or more SIBs includes a change with respect to the previous version of the SIB; compare the value tag associated with the SIB1 with a value tag stored at the UE; obtain, from the SIB1, scheduling information for the one or more SIBs that include a change according to the bitmap when the value tag associated with the SIB1 does not equal to the value tag stored at the UE; and retrieve the one or more SIBs that include a change using the scheduling information obtained from the SIB1, see paragraph 93).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to combine the teachings Jha with the teachings of Johansson in order to save power.

Nonetheless, the combination of Johansson and Jha does not expressly disclose that the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process

In the same field of endeavor, R2-1805017 discloses that the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process (in the case the UE request fails, the UE should backoff for 1 full BCCH Modification period, and during this period, the UE should monitor SIB1 to find out whether the required SI is being broadcast, see section 2.3.1).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to combine the teachings of R2-

1805017 with the teachings of Johansson and Jha in order to prevent the UE from retrying again and again resulting in potential increase in collision.

Consider claims 2 and 4, and as applied to claims 1 and 3 respectively above, R2-1805017 discloses wherein the processor circuitry is further configured to re-initiate the SI message acquisition process based on the first type SIB acquisition process being initiated upon the failure of the SI message acquisition process (if so, it can perform SI (re)acquisition procedure for the SI once SIB1 indicates that the SI is broadcast, and if not, the UE can attempt again, see section 2.3.1)

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to combine the teachings of R2-1805017 with the teachings of Johansson and Jha in order to prevent the UE from retrying again and again resulting in potential increase in collision.

Consider claims 5 and 7, Johansson discloses a method and base station apparatus of a radio access network (RAN) (base station eNodeB 202 see Fig. 2 and paragraph 26) that communicates over a radio interface with a use equipment (user equipment UE 201, see Fig. 2 and paragraph 26) , the base station apparatus comprising:

transmitter circuitry configured to transmit first type system information block (SIB) (transceiver 223, configuration module 225, see Fig. 2 and paragraph 27) a first type SIB (minimum SI, paragraph 29), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB (the minimum SI comprises the MIB and an SI list containing information for acquiring any other SI, paragraph 29); and

an indication of broadcast status for the SI message, the indication indicating broadcasting (For example, the SI list indicates that SIB1-SIB3 are scheduled to be broadcasted with corresponding scheduling information, and SIB4-SIB11 will not be broadcasted periodically, paragraph 30);

processor circuitry configured to use the transmitter circuitry to broadcast the SI message (transceiver 223, Fig. 2)'

However, Johansson does not expressly disclose wherein the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid .

In the same field of endeavor Jha discloses a case that a version of one of the at least one second type SIB stored in the user equipment is not valid (receive, at the UE from the eNodeB, one or more system information (SI) change notifications that indicate a change has occurred in one or more system information blocks (SIBs) with respect to a previous version of the one or more SIBs; receive, at the UE, a SIB1 that is broadcast from the eNodeB, wherein the SIB1 is associated with a value tag and the SIB1 includes a bitmap that indicates which of the one or more SIBs includes a change with respect to the previous version of the SIB; compare the value tag associated with the SIB1 with a value tag stored at the UE; obtain, from the SIB1, scheduling information for the one or more SIBs that include a change according to the bitmap

when the value tag associated with the SIB1 does not equal to the value tag stored at the UE; and retrieve the one or more SIBs that include a change using the scheduling information obtained from the SIB1, see paragraph 93).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to combine the teachings Jha with the teachings of Johansson in order to save power.

Nonetheless, the combination of Johansson and Jha does not expressly disclose the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message.

In the same field of endeavor, R2-1805017 discloses the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message (in the case the UE request fails, the UE should backoff for 1 full BCCH Modification period, and during this period, the UE should monitor SIB1 to find out whether the required SI is being broadcast, see section 2.3.1).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to combine the teachings of R2-1805017 with the teachings of Johansson and Jha in order to prevent the UE from retrying again and again resulting in potential increase in collision.

Consider claims 6 and 8, and as applied to claims 5 and 7 respectively above, R2-1805017 discloses wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process (if so, it

can perform SI (re)acquisition procedure for the SI once SIB1 indicates that the SI is broadcast, and if not, the UE can attempt again, see section 2.3.1)

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to combine the teachings of R2-1805017 with the teachings of Johansson and Jha in order to prevent the UE from retrying again and again resulting in potential increase in collision.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GERMAN VIANA DI PRISCO whose telephone number is (571)270-1781. The examiner can normally be reached on Monday through Friday 8:30-5:00 EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, RAFAEL PEREZ-GUTIERREZ can be reached on (571) 272-7915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/GERMAN VIANA DI PRISCO/
Primary Examiner, Art Unit 2642

Notice of References Cited	Application/Control No. 16/408,922	Applicant(s)/Patent Under Reexamination ISHII, Atsushi	
	Examiner GERMAN VIANA DI PRISCO	Art Unit 2642	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20180049107-A1	02-2018	Johansson; Per Johan Mikael	H04W48/10	1/1
*	B	US-20180124685-A1	05-2018	Jha; Satish	H04W48/12	1/1
*	C	US-20180324679-A1	11-2018	Basu Mallick; Prateek	H04W48/12	1/1
	D					
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	F					
	G					
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	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	Art Unit
	GERMAN VIANA DI PRISCO	2642

CPC - Searched*		
Symbol	Date	Examiner
H04W48/10, H04W48/14, H040/24, H04W74/002, H04W74/006 (text search)	08/07/2019	GV

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
EAST Image and keyword search in USPAT, US-PGPUB, DERWENT, EPO, JPO, and IBM_TDB (see attached search strategy)	08/07/2019	GV
Inventor name and Assignee search in PALM ExPO and EAST	08/07/2019	GV
EPO Database(http://ep.espacenet.com)	08/07/2019	GV

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	**Art Unit**
	GERMAN VIANA DI PRISCO	2642

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant					☐ CPA		☐ T.D.		☐ R.1.47	
CLAIM		**DATE**								
Final	Original	08/07/2019								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								

INFORMATION DISCLOSURE CITATION	ATTY. DOCKET NO.	APPLICATION NO.
	SLA3814.1_6112-0174	To Be Assigned
	INVENTOR(S)	
	ISHII	
(Use several sheets if necessary)	FILING DATE	ART UNIT
	May 10, 2019	To Be Assigned

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

FOREIGN PATENT DOCUMENTS

		DOCUMENT	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)

	1	R2-1804881, 3GPP TSG-RAN2 101bis, Samsung, "SIB1 Content for SI Request", Sanya, China, April 16-20, 2018
	2	R2-1805225, 3GPP TSG-RAN2 101bis, Huawei, HiSilicon, "MSG3 based other SI acquisition", Sanya, China, April 16-20, 2018
	3	R2-1804528, 3GPP TSG-RAN2 101bis, OPPO, "Discussion on Upper Layer Action upon RACH Problem and SI prohibit Timer", Sanya, China, April 16-20, 2018
	4	R2-1805057, 3GPP TSG-RAN2 101bis, LG Electronics Inc., "Clarification of broadcast indicator in SIB1", Sanya, China, April 16-20, 2018
	5	R2-1804987, 3GPP TSG-RAN2 101bis, Ericsson, "Duration of on-demand SI broadcast", Sanya, China, April 16-20, 2018
	6	R2-1805223, 3GPP TSG-RAN2 101bis, Huawei, HiSilicon, "Consideration on Indication for On-demand SI Broadcast", Sanya, China, April 16-20, 2018
	7	R2-1804266, 3GPP TSG-RAN2 101bis, CATT, "Open issues for Broadcasting Indicator", Sanya, China, April 16-20, 2018
	8	R2-1804267, 3GPP TSG-RAN2 101bis, CATT, "Indicator Granularity of on-demand SI Request", Sanya, China, April 16-20, 2018
	9	R2-1804268, 3GPP TSG-RAN2 101bis, CATT, "Awareness and RRC Action of on-demand SI Request Failure", Sanya, China, April 16-20, 2018
	10	R2- R2-1804284, 3GPP TSG-RAN2 101bis, ASUSTeK, "Msg1-based or Msg3-based SI request procedure", Sanya, China, April 16-20, 2018
	11	R2-1804309, 3GPP TSG-RAN2 101bis, Samsung, "SI Request Failure Handling & SI Period Monitoring for On Demand SI", Sanya, China, April 16-20, 2018
	12	R2-1804442, 3GPP TSG-RAN2 101bis, ZTE Corporation, Sanechips, "Consideration on the RACH resource and SI request mapping", Sanya, China, April 16-20, 2018
	13	R2-1804443, 3GPP TSG-RAN2 101bis, ZTE Corporation, Sanechips, "Consideration on Group based SI request Scheme", Sanya, China, April 16-20, 2018
	14	R2-1804444, 3GPP TSG-RAN2 101bis, ZTE Corporation, Sanechips, "Upper layer actions for the Random Access problem", Sanya, China, April 16-20, 2018
	15	R2-1804469, 3GPP TSG-RAN2 101bis, Spreadtrum Communications, "Msg1-based on-demand SI request", Sanya, China, April 16-20, 2018
	16	R2-1804592, 3GPP TSG-RAN2 101bis, vivo, "Beam Based on Demand SI Acquisition for Idle/Inactive UE", Sanya, China, April 16-20, 2018
	17	R2-1804593, 3GPP TSG-RAN2 101bis, vivo, "Failure Handling for On Demand SI Acquisition Procedure", Sanya, China, April 16-20, 2018

*Examiner	/GERMAN VIANA DI PRISCO/	Date Considered	08/07/2019

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

)

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.V/

2919938

Sheet **2** of **2**

INFORMATION DISCLOSURE CITATION	ATTY. DOCKET NO.	APPLICATION NO.
	SLA3814.1_6112-0174	To Be Assigned
	INVENTOR(S)	
	ISHII	
(Use several sheets if necessary)	FILING DATE	ART UNIT
	May 10, 2019	To Be Assigned

	18	R2-1804624, 3GPP TSG-RAN2 101bis, Xiaomi, "Further issues relates to on-demand SI", Sanya, China, April 16-20, 2018	
	19	R2-1804984, 3GPP TSG-RAN2 101bis, Ericsson, "On-demand SI reject procedure", Sanya, China, April 16-20, 2018	
	20	R2-1804998, 3GPP TSG-RAN2 101bis, LG Electronics Inc., "Details of MSG3 for SI request", Sanya, China, April 16-20, 2018	
	21	R2-1805017, 3GPP TSG-RAN2 101bis, Intel Corporation, "Remaining issues on on-demand System Information", Sanya, China, April 16-20, 2018	
	22	R2-1805224, 3GPP TSG-RAN2 101bis, Huawei, HiSilicon, "Consideration on MSG1 based OSI request", Sanya, China, April 16-20, 2018	
	23	R2-1805226, 3GPP TSG-RAN2 101bis, Huawei, HiSilicon, "Failure Handling for OSI Reception", Sanya, China, April 16-20, 2018	
	24	R2-1805933, 3GPP TSG-RAN2 101bis, LG Electronics Inc., "RACH failure for SI request", Sanya, China, April 16-20, 2018	
	25	U.S. Patent Application 16/408,853 filed May 10, 2019, entitled "APPARATUS AND METHOD FOR ACQUISITION OF ON-DEMAND SYSTEM INFORMATION IN WIRELESS COMMUNICATIONS"	

*Examiner	/GERMAN VIANA DI PRISCO/	Date Considered	08/07/2019

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

)

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.V/

2919938

Sheet 1 of 1

INFORMATION DISCLOSURE CITATION	ATTY. DOCKET NO.	APPLICATION NO.
	SLA3814.1_6112-0174	16/408,922
	INVENTOR(S)	
	ISHII	
(Use several sheets if necessary)	FILING DATE	ART UNIT
	May 10, 2019	2642

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
		2017/0064764	3-2017	Qualcomm Incorporated			
		2017/0251500	8-2017	Samsung Electronics Co., Ltd.			
		2015/0038142	2-2015	Broadcom Corporation			
		2014/0086173	3-2014	Interdigital Patent Holdings, Inc.			
		2015/0215757	7-2015	Miskiewicz et al.			
		2017/0325049	11-2017	Panasonic Intellectual Property Corporation of America			
		2010/0323714	12-2010	Schmidt et al.			

FOREIGN PATENT DOCUMENTS

		DOCUMENT	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
		WO 2017/197063 A1	11-2017	WIPO/PCT				

OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)

		International Search Report and Written Opinion mailed 23 July 2019 in PCT application PCT/US2019/031674

*Examiner	/GERMAN VIANA DI PRISCO/	Date Considered	08/07/2019

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

)

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.V/

2939439

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1306	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:16
L2	15	1 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:17
L3	10	1 and sib and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:18
L8	4457	(sharp adj laboratories fg adj innovation)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:25
L9	42	8 and sib and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:25
L17	39197	(H04W48/10 H04W48/14 H040/24 H04W74/002 H04W74/006).cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:09
L18	554	17 and sib$1 and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:09
L19	1928	17 and sib$1 and broadcast$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:11
S1	440	sib1 with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/06 17:24
S2	133	sib1 with (includ$3 indicat$3) with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/06 17:24
S3	133	sib1 with (includ$3 indicat$3) with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 09:34
S4	47	S3 and (valid validity)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 09:34

S5	204	sib near3 valid	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 11:00
S6	2	S3 and S5	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 11:03

EAST Search History (Interference)

< This search history is empty>

8/7/2019 3:14:35 PM
C:\ Users\ gvianadiprisco\ Documents\ EAST\ Workspaces\ 16408922.wsp

Bibliographic Data

Application No: 16/408,922

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /GERMAN VIANA DI PRISCO/ (Examiner's Signature) | Initials

Title: APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
05/10/2019	455	2642	SLA3814_1_6112-0174
RULE			

APPLICANTS

SHARP Laboratories of America, Inc., Vancouver, WA,

FG Innovation Company Limited, Hong Kong, CHINA

INVENTORS

Atsushi ISHII Vancouver, WA, UNITED STATES

CONTINUING DATA

This application is a CON of PCT/US2019/031674 05/10/2019

PCT/US2019/031674 has PRO of 62669851 05/10/2018

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

05/21/2019

STATE OR COUNTRY

UNITED STATES

ADDRESS

NIXON & VANDERHYE, P.C. / SLA

901 N. Glebe Road, 11th Floor

Arlington, VA 22203

UNITED STATES

FILING FEE RECEIVED

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UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/408,922	05/10/2019	Atsushi ISHII	HWB-1035-1395

CONFIRMATION NO. 1156

126613
NIXON & VANDERHYE, P.C. / SLA
901 N. Glebe Road, 11th Floor
Arlington, VA 22203

PUBLICATION NOTICE

OC000000112628071

Title:APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION

Publication No.US-2019-0349841-A1
Publication Date:11/14/2019

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	Atty. Ref.: HWB-1035-1395
ISHII	Confirmation No. 1156
Appl. No. 16/408,922	Art Unit: 2642
Filed: 05/10/2019	Examiner: VIANA DI PRISCO, GERMAN

For: APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATIONS

* * * * * * * * * * * *

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

December 16, 2019

Sir:

AMENDMENT

Responsive to the Official Action dated August 21, 2019, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2.

Remarks/Arguments begin on page 6.

Electronic Acknowledgement Receipt

EFS ID:	38040478
Application Number:	16408922
International Application Number:	
Confirmation Number:	1156
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Customer Number:	126613
Filer:	H. Warren Burnam
Filer Authorized By:	
Attorney Docket Number:	HWB-1035-1395
Receipt Date:	16-DEC-2019
Filing Date:	10-MAY-2019
Time Stamp:	14:41:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		18236US_1035-1395_amendment_2019_December_16.pdf	134112 31b06ca887fcc9a64c5451b2bf6e5eef4610c9c2	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	6	8
	Claims	2	5
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	134112	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REMARKS/ARGUMENTS

Reconsideration of the captioned application is respectfully requested.

A. SUMMARY OF THIS AMENDMENT

By the current amendment, Applicant basically:

1. Editorially amends independent claims 1, 3, 5, and 7.
2. Respectfully traverses all rejections.

B. THE CLAIMS ARE CLEAR AND DEFINITE

Independent claim 1 has been amended to delete the phrase "the at least one second type SIB", thereby mooting the rejection under 35 USC 112(b).

C. THE PRIOR ART REJECTIONS

Claims 1-8 stand rejected under 35 U.S.C. 103 as allegedly being unpatentable over US 2018/0049107 to Johansson et al in view of US 2018/0124685 to Jha, and further in view of 82-1805017, 3GPP TSG-RAN2 101bis, Intel Corporation, "Remaining issues On Demand System Information", Sanya, China, April 16-20, 2018 (hereinafter "R2-1805017"). All prior art rejections are respectfully traversed for at least the following reasons.

D. PATENTABILITY OF THE CLAIMS

According to the independent claims 1 and 3, a user equipment receives first type SIB including indication of broadcast status for the SI message. According to the independent claims 5 and 7, a base station apparatus transmits first type SIB including indication of broadcast status for the SI message. In other words, the independent claims specify that the SI message is broadcasted. Accordingly, "a failure of the SI message acquisition process" occurs upon failure to receive the SI message that is broadcasted.

In contrast, the R2-1805017 prior art reference applied in the non-final office action states that the "UE will initiate an on-demand SIB request for a particular SI/SIB if

the SI scheduling info in SIB 1 for this SIB indicates that a UE request is required." See, e.g., R2-1805017, section 2.3, entitled “Failure handling for UE SI request”. In other words a base station of R2-1805017 requires an SIB request in order to transmit an SI message to UE (i.e., an on-demand SIB request). Accordingly, the R2-1805017 discussion of "In the case the UE request fails" indicates and pertains only to a failure of on-demand SIB request for a particular SI/SIB, not a failure of a broadcasted SI message. Therefore, the combination of prior art references including R2-1805017 does not teach or suggest the subject matter of the independent claims.

E. MISCELLANEOUS

In view of the foregoing and other considerations, all claims are deemed in condition for allowance. A formal indication of allowability is earnestly solicited.

Applicant does not acquiesce as to any assertion in the office action, including but not limited to any assertion with respect to the prior art or to Applicant’s claims. Applicant’s silence with respect to any assertion in the office action should not be interpreted as Applicant’s acquiescence thereto. Applicant reserves the right to comment further with respect to the applied references and any pending claim in a future Amendment, Response, or on appeal.

The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

Should the Examiner feel that an interview with the undersigned would facilitate allowance of this application, the Examiner is encouraged to contact the undersigned.

EX-1002
Ericsson Inc., Nokia v. Active Wireless Technologies
Page 289

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: /H. Warren Burnam, Jr./

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Arlington, VA 22203-1808
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AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the user equipment comprising:

processor circuitry configured to initiate a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising:

scheduling information of a ~~second type~~ system information (SI) message, the ~~second type~~ SI message comprising at least one second type ~~system information block~~ (SIB); and

an indication of broadcast status for the ~~second type~~ SI message, the indication indicating broadcasting;

receiver circuitry configured to receive the first type SIB; and

the processor circuitry further configured to initiate an SI message acquisition process to receive the SI message; wherein

~~in a case that a stored version of one of the at least one second type SIB is not valid,~~ the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

2. (Original) The user equipment of claim 1, wherein the processor circuitry is further configured to re-initiate the SI message acquisition process based on the first type SIB acquisition process being initiated upon the failure of the SI message acquisition process.

3. (Currently Amended) A method for a user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the method comprising:

initiating a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and

an indication of broadcast status for the SI message, the indication indicating broadcasting;

receiving the first type SIB; and

initiating an SI message acquisition process to receive the SI message; wherein

~~in a case that a stored version of one of the at least one second type SIB is not valid,~~ the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

4. (Original) The method of claim 3, further comprising re-initiating the SI message acquisition process based on the first type SIB acquisition process being initiated upon the failure of the SI message acquisition process.

5. (Currently Amended) A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:

~~transmitter~~ transmitting circuitry configured to transmit first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and

an indication of broadcast status for the SI message, the indication indicating broadcasting;

processor circuitry configured to use the transmitter circuitry to broadcast the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message~~, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid~~.

6. (Original) The base station apparatus of claim 5, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

7. (Currently Amended) A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, comprising:

transmitting first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and

an indication of broadcast status for the second type SI message, the indication indicating broadcasting;

broadcasting the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message~~, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid~~.

8. (Original) The method of claim 7, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

Electronic Patent Application Fee Transmittal

Application Number:	16408922
Filing Date:	10-May-2019
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Filer:	H. Warren Burnam
Attorney Docket Number:	HWB-1035-1395

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	1251	1	200	200
Miscellaneous:				
		Total in USD ($)		**200**

Electronic Acknowledgement Receipt

EFS ID:	38040816
Application Number:	16408922
International Application Number:	
Confirmation Number:	1156
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Customer Number:	126613
Filer:	H. Warren Burnam
Filer Authorized By:	
Attorney Docket Number:	HWB-1035-1395
Receipt Date:	16-DEC-2019
Filing Date:	10-MAY-2019
Time Stamp:	14:52:14
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$200
RAM confirmation Number	E2019BFE52398640
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Fee Worksheet (SB06)	fee-info.pdf	30943 871fd00296d916175292c9baa31a52fd8e283ecb	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	30943		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/408,922	Filing Date 05/10/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	12/16/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 8	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 4	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/ANTHONY TYSON/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Sheet 1 of 1

INFORMATION DISCLOSURE CITATION	ATTY. DOCKET NO.	APPLICATION NO.
	181236US_1035-1395	16/408,922
	INVENTOR(S)	
	ISHII	
(Use several sheets if necessary)	FILING DATE	ART UNIT
	May 10, 2019	2642

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
		2019/0364601	11-2019	Kami			
		2019/0349983	11-2019	Loehr			
		2019/0349840	11-2019	Zhang			
		2019/0319764	10-2019	Nader			
		2019/0223154	7-2019	Jia			
		2019/0165984	5-2019	Shapin			
		2018/0310235	10-2018	You			
		2017/0064764	3-2017	Ke			
		2016/017425	6-2016	Zhang			
		2019/0349841	11-2019	Ishii			
		2016/0234736	8-2016	Qualcomm Incorporated			
		2018/0132168	5-2018	Samsung Electronics Co., Ltd.			

FOREIGN PATENT DOCUMENTS

		DOCUMENT	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)

		Notice of Allowance mailed January 13, 2020 in U.S. Patent Application 16/408,853
		International Search Report and Written Opinion mailed 9 August 2019 in PCT Application PCT/US2019/031669

*Examiner		Date Considered	

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

)

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AUG 12 2019 PM1:57

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: H. WARREN BURNAH JR.
NIXON & VANDERHYE P. C.
901 NORTH GLEBE, 11TH FLOOR
ARLINGTON, VA 22203-1808

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)* 09 AUG 2019
Applicant's or agent's file reference SLA3814PCT HWB-6112-0171	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US2019/031669	International filing date *(day/month/year)* 10 May 2019
Applicant SHARP LABORATORIES OF AMERICA, INC.	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

   How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
   ☐ the protest together with the decision thereon has been transmitted to the international Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
   ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

   Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before these designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

   Within **22 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 Telephone No. PCT OSP: 571-272-7774

Form PCT/ISA/220 (July 2017)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
SLA3814PCT HWB-6112-0171		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/US2019/031669	10 May 2019	10 May 2018
Applicant SHARP LABORATORIES OF AMERICA, INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of:

   ☒ 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 (Rules 12.3(a) and 23.1(b)).

   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).

   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (see Box No. II).

3. ☐ **Unity of invention is lacking** (see Box No. III).

4. With regard to the **title**,

   ☒ the text is approved as submitted by the applicant.

   ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

   ☒ the text is approved as submitted by the applicant.

   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

   a. the figure of the **drawings** to be published with the abstract is Figure No. 1

   ☐ as suggested by the applicant.

   ☒ as selected by this Authority, because the applicant failed to suggest a figure.

   ☐ as selected by this Authority, because this figure better characterizes the invention.

   b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/031669

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.01)
CPC - H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.05)

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)
See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC - 370/329; 370/328; 370/331 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2015/0038142 A1 (BROADCOM CORPORATION) 05 February 2015 (05.02.2015) entire document	1-8
A	WO 2017/197063 A1 (IDAC HOLDINGS, INC.) 16 November 2017 (16.11.2017) entire document	1-8
A	US 2017/0325049 A1 (PANASONIC INTELLECTUAL PROPERTY CORPORATION OF AMERICA) 09 November 2017 (09.11.2017) entire document	1-8
A	US 2016/0234736 A1 (QUALCOMM INCORPORATED) 11 August 2016 (11.08.2016) entire document	1-8
A	US 2017/0064764 A1 (QUALCOMM INCORPORATED) 02 March 2017 (02.03.2017) entire document	1-8
P,A	US 2018/0132168 A1 (SAMSUNG ELECTRONICS CO., LTD.) 10 May 2018 (10.05.2018) entire document	1-8
A	US 2017/0251500 A1 (SAMSUNG ELECTRONICS CO., LTD.) 31 August 2017 (31.08.2017) entire document	1-8

☐ 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	Date of mailing of the international search report
31 July 2019	09 AUG 2019
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	Authorized officer Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (January 2015)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: H. WARREN BURNAH JR.
NIXON & VANDERHYE P. C.
901 NORTH GLEBE, 11TH FLOOR
ARLINGTON, VA 22203-1808

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

	Date of mailing *(day/month/year)* 09 AUG 2019
Applicant's or agent's file reference SLA3814PCT HWB-6112-0171	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2019/031669	10 May 2019	10 May 2018

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.01)
CPC - H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.05)

Applicant SHARP LABORATORIES OF AMERICA, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ 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 Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and 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

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, VA 22313-1450 Facsimile No. 571-273-8300	31 July 2019	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (January 2015)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2019/031669

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ 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 (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2019/031669

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-8	YES
	Claims	None	NO
Inventive step (IS)	Claims	1-8	YES
	Claims	None	NO
Industrial applicability (IA)	Claims	1-8	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1-8 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest:

Regarding claims 1, 3 the prior art of record, individually or in combination, does not teach or fairly suggest to initiate a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising: scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and an indication of broadcast status for the SI message, the indication indicating on-demand delivery; to transmit an SI request message to request the SI message; to initiate an SI message acquisition process to receive the SI message; wherein in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

Regarding claims 5, 7 the prior art of record, individually or in combination, does not teach or fairly suggest to transmit first type system information block (SIB), the first type SIB comprising: scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and an indication of broadcast status for the SI message, the indication indicating on-demand delivery; to receive an SI request message to request the SI message; the transmitter circuitry to deliver the SI message; wherein the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid.

The prior art teaches some of the concepts and/or aspects of the claim limitations as shown below, but does not teach the claim limitations in their entirety and as specifically recited in each of the claims:

Qualcomm Incorporated (US 2017/0064764 A1) teaches user equipment communicating over a radio interface with a base station of a radio access network (A wireless communication network may include a number of base stations that can support communication for a number of user equipments, para.0006; wireless networks implementing radio technologies, para.0021), initiate a first type system information block acquisition process to receive a first type SIB (concurrent SIB decoding during initial SIB1 acquisition, para.0060; combining multiple transmissions of at least a first type of system information block (SIB) message across different system information (SI) message windows and a second buffer for combining multiple transmissions of at least a second type of SIB message within an SI window. At 604, the apparatus decodes at least the first and second types of SIB messages based on contents in the first and second buffers, para.0058), scheduling information of a system information (SI) message (a particular SIB may be transmitted within an SI message. A UE may attempt to acquire the SIB by listening starting from the beginning of the SI window for SI messages including the SIB until the SIB is acquired, para.0053; The SI window may be defined to enable retransmission of the SI message within the SI window, para.0054), the SI message comprising at least one second type SIB (a second buffer for combining multiple transmissions of at least a second type of SIB message within an SI window, para.0058), receive the first type SIB (concurrent SIB decoding during initial SIB1 acquisition, para.0060; combining multiple transmissions of at least a first type of system information block (SIB) message across different system information (SI) message windows, para.0058).
However, Qualcomm Incorporated does not explicitly teach a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising: scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and an indication of broadcast status for the SI message, the indication indicating on-demand delivery; an SI request message to request the SI message; wherein in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process and wherein the first type SIB is re-acquired by the user equipment.

Qualcomm Incorporated (US 2016/0234736 A1) teaches the first type SIB (i.e. MSIB, see Fig.4) and second type SIB (i.e. OSIB, see Fig.4) are requested and acquired separately (Fig.4, Steps 405-420, 430-445, para.0131, 0132). Hwoever, Qualcomm incorporated does not teach that the first type SIB comprises scheduling information of at least second type SIB and teach initiating first type SIB acquisition process upon failure of SI message acquisition in a case when second type SIB is not valid.

IDAC Holdings, Inc. (WO 2017/197063 A1) teaches user equipment communicating over a radio interface with a base station of a radio access network (The communications system 100 may include a base station 114a and a base station 114b. Each of the base stations 114a, 114b may be any type of device configured to wirelessly interface with at least one of the WTRUs 102a, 102b, 102c, 102d to facilitate access to one or more communication networks, para.0026; communication system include a radio access network, para.0025), initiate a system information block acquisition process (a WTRU may transmit a reserved RACH preamble to request system information. For example, such reserved RACH preambles may be used to indicate a specific system information block, para.0276; The SIB numbering may further be based on the SIBs that the cell has available, para.0313), scheduling information of a system information (SI)

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

message (a WTRU may determine the presence of other-SI based on scheduling information in the essential SI. For example, a WTRU may trigger other-SI request if a WTRU may determine that the broadcast of other-SI is stopped before the WTRU can acquire the required other-SI and/or if a WTRU determines that one or more specific other-SI required by the WTRU is not present in the current schedule of other-SI broadcast, para.0269), an indication of broadcast status for the SI message, the indication indicating on-demand delivery (one or more on- demand SI messages to be requested. At 804, the WTRU may transmit (TX) information for reception of the one or more on-demand SI messages using the one or more determined UL resources. At 806, the WTRU may receive a message (e.g.,MSG2) that may be associated with the requested on-demand SI, para.0342), an SI request message to request the SI message (on- demand SI messages to be requested, para.0342).
However, IDAC Holdings, Inc. does not explicitly teach a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising: scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and an indication of broadcast status for the SI message, the indication indicating on-demand delivery; an SI request message to request the SI message; wherein in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process and wherein the first type SIB is re-acquired by the user equipment.

Samsung Electronics Co., Ltd. (US 2017/0251500 A1) teaches user equipment communicating over a radio interface with a base station of a radio access network (transmitting system information (SI) to user equipment by a base station (BS) in a wireless communication system, para.0017; using radio access technology for communications, para.0009), initiate a first type system information block (SIB) acquisition process to receive a first type SIB (minimum SI or essential SI may include a separate indication for each SI (e.g. system information block (SIB)) or set of SIs (i.e. SIBs) wherein each indication indicates whether the associated SI or set of SIs are periodically broadcasted or are provided on demand, para.0052; first type SI associated with SI which is essential for communication with the BS, para.0016), scheduling information of a system information (SI) message (minimum SI or essential SI may include a separate indication for each SI message wherein each SI message carries one or more SIs (i.e. SIBs), para.0053), an indication of broadcast status for the SI message, the indication indicating on-demand delivery (The indication associated with an SI message indicates whether SIs associated with that SI message are broadcasted or provided on demand, para.0053), an SI request message to request the SI message (UE sends request to base station (BS) to receive that SI, para.0054; The SI request message indicates one or more system information (e.g. SIBs) which UE needs or indicates one or more sets of system information which the UE needs or indicates service, para.0057).
However, Samsung Electronics Co., Ltd. does not explicitly teach a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising: scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and an indication of broadcast status for the SI message, the indication indicating on-demand delivery; an SI request message to request the SI message; wherein in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process and wherein the first type SIB is re-acquired by the user equipment.

Additional references which are of related interest to the instant invention include:
Broadcom Corporation (US 2015/0038142 A1)

Panasonic Intellectual Property Corporation of America (US 2017/0325049 A1)

None of these references whether taken singly or in combination explicitly teach or suggest a first type system information block (SIB) acquisition process to receive a first type SIB, the first type SIB comprising: scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB; and an indication of broadcast status for the SI message, the indication indicating on-demand delivery; an SI request message to request the SI message; wherein in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process and wherein the first type SIB is re-acquired by the user equipment.

Regarding claims 2, 4, 6, 8, each claim depends from base claims 1, 3, 5, 7 respectively and therefore meet the criteria set out in PCT Article 33(2)-(3), for at least the same reasons as base claims 1, 3, 5, 7.

Claims 1-8 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Search History:

Limited Classification Search

The Patent Analyst performed a limited classification search within the following US, IPC, CPC, ECLA, or F-Term classification areas:

CPC Class/Subclass(es): H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.05)

IPC (8) Class/Subclass(es): H04W 48/10; H04W 4/06; H04W 48/12; H04W 16/14 (2019.01)

U.S. Class/Subclass(es): 370/329; 370/328; 370/331

See Global Search Results.

Global Patent Literature Text Search

The Patent Analyst performed the following global text search, which was not limited by classification but may or may not have been limited by other criteria:

Minesoft PatBase: https//www.patbase.com

#	Search query	Results
1	PA=(SHARP LABORATORIES OF AMERICA, INC.)	2132
2	FT=((radio w2 network) AND (base w2 station*) AND ((system w2 information) w2 block) AND (first w2 type) AND (second w2 type) AND status AND broadcast*) and PA=(SHARP LABORATORIES OF AMERICA, INC.)	4
3	FT=((radio w2 network) AND (base w2 station*) AND ((system w2 information) w2 block) AND (first w2 type) AND (second w2 type) AND status AND broadcast*)	331
4	FT=((radio w2 network) AND (base w2 station*) AND ((system w2 information) w2 block) AND (first w2 type) AND (second w2 type) AND status AND broadcast* AND (SI w2 message*) AND request* AND fail*)	15
5	FT=((radio w2 network) AND (base w2 station*) AND ((system w2 information) w2 block) AND (first w2 type) AND (second w2 type) AND status AND broadcast* AND (SI w2 message*) AND request* AND fail* AND valid*)	10
6	PN=(US2017064764 OR WO17197063 OR US2017251500 OR US2015038142)	4
7	IC=(H04W48/10)	3805
8	3 AND 7	26
9	IC=(H04W4/06)	16803
10	3 AND 9	14
11	IC=(H04W48/12)	3573
12	3 AND 11	25
13	IC=(H04W16/14)	8599
14	3 AND 13	19

15	CPC=(H04W48/10)	2513
16	3 AND 15	20
17	CPC=(H04W4/06)	8056
18	3 AND 17	12
19	CPC=(H04W48/12)	3512
20	3 AND 19	26
21	CPC=(H04W16/14)	6458
22	3 AND 21	16
23	UC=(370/329)	26941
24	3 AND 23	118
25	UC=(370/328)	15360
26	3 AND 25	30
27	UC=(370/331)	9045
28	3 AND 27	23

Google Patents: https://patents.google.com

#	Search query	Results
1	(APPARATUS AND METHOD FOR ACQUISITION OF ON-DEMAND SYSTEM INFORMATION IN WIRELESS COMMUNICATIONS)	100+
2	"system information broadcast" "SI message" "first type" "second type" "base station" "radio access network"	4
3	"system information broadcast" "SI message" "first type" "second type" "base station" "request" "valid"	2
4	"SIB" "SI message" "first type" "second type" "base station" "radio"	14
5	"first type SIB" "second type SIB" "request" "message"	3
6	"system information block" "scheduling information" "request" "message" "first type" "second type"	100+
7	"system information block" "scheduling information" "request" "message" "first type" "second type" "broadcast" "valid"	100+
8	(in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process)	100+
9	(in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process) "first type" "SIB" "second type"	38
10	(the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid)	100+

11	(the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid) "first type" "second type"	100+
12	"SIB" "first type" "second type" "SI message"	34
13	"SIB" "first type" "second type" "SI message" "request" "broadcast"	12
14	"SIB" "first type" "second type" "RAN" "message" "request" "broadcast"	100+
15	(radio access network) (system information block) (first type SIB) (second type SIB) (scheduling information) (SI request message)	100+
16	(radio access network) (system information block) (first type SIB) (second type SIB) (scheduling information) (SI request message) (broadcast) (on-demand delivery) (valid) (failure)	100+

Computer Accessed Text Databases Searched

The Patent Analyst searched the following computer accessed text databases:

Google Scholar: https://scholar.google.com/

#	Search query	Results
1	(APPARATUS AND METHOD FOR ACQUISITION OF ON-DEMAND SYSTEM INFORMATION IN WIRELESS COMMUNICATIONS)	100+
2	"system information broadcast" "SI message" "first type" "second type" "base station" "radio access network"	0
3	"system information broadcast" "SI message" "first type" "second type" "base station" "request" "valid"	0
4	"SIB" "SI message" "first type" "second type" "base station" "radio"	0
5	"first type SIB" "second type SIB" "request" "message"	0
6	"system information block" "scheduling information" "request" "message" "first type" "second type"	2
7	"system information block" "scheduling information" "request" "message" "first type" "second type" "broadcast" "valid"	2
8	(in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process)	100+
9	(in a case that a stored version of one of the at least one second type SIB is not valid, the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process) "first type" "SIB" "second type"	44
10	(the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of one of the at least one second type SIB stored in the user equipment is not valid)	44
11	(the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message, in a case that a version of	44

	one of the at least one second type SIB stored in the user equipment is not valid) "first type" "second type"	
12	"SIB" "first type" "second type" "SI message"	0
13	"SIB" "first type" "second type" "SI message" "request" "broadcast"	0
14	"SIB" "first type" "second type" "RAN" "message" "request" "broadcast"	13
15	(radio access network) (system information block) (first type SIB) (second type SIB) (scheduling information) (SI request message)	100+
16	(radio access network) (system information block) (first type SIB) (second type SIB) (scheduling information) (SI request message) (broadcast) (on-demand delivery) (valid) (failure)	32

Date search was completed: 31 July 2019

AK/MP

Electronic Patent Application Fee Transmittal

Application Number:	16408922
Filing Date:	10-May-2019
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Filer:	H. Warren Burnam/Linda Hull
Attorney Docket Number:	HWB-1035-1395

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	240	240
		Total in USD ($)		**240**

Electronic Acknowledgement Receipt

EFS ID:	38402975
Application Number:	16408922
International Application Number:	
Confirmation Number:	1156
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Customer Number:	126613
Filer:	H. Warren Burnam
Filer Authorized By:	
Attorney Docket Number:	HWB-1035-1395
Receipt Date:	27-JAN-2020
Filing Date:	10-MAY-2019
Time Stamp:	14:07:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$240
RAM confirmation Number	E20201QE07298789
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		181236US_1035-1395_IDS_1449_submitting_1396_refs.pdf	145235 3b1bc4b29b42222dd89a8f88939f47335f2efc51	yes	3
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Transmittal Letter		1	2	
	Information Disclosure Statement (IDS) Form (SB08)		3	3	
Warnings:					
Information:					
2	Non Patent Literature	1035-1396_NOAllowance.pdf	572255 93eed4979d6db06374c11b946e40edbe0b651852	no	12
Warnings:					
Information:					
3	Non Patent Literature	1035-1396_ISR_WO.pdf	1347416 63c89198ca1abca52db985f658f1b59ea14a5eea	no	11
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30525 7d9cfa3d2ae4fc092b018851a9e88e540cf93d9f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	2095431		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	Conf. No.: 1156
ISHII	Atty. Dkt. No.: 181236US_1035-1395
Appln. No. 16/408,922	Art Unit: 2642
Filed: May 10, 2019	Examiner: Viana Di Prisco, German

For: APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION

* * * * * * * * * * * *

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Date: January 27, 2020

INFORMATION DISCLOSURE STATEMENT

Sir:

☐ 1. **PTO-1449 Pursuant to 37 CFR 1.97(b)**
[within 3 months of filing or prior to 1st Office Action] *N/C*

☐ 2. **Statement Pursuant to 37 CFR 1.97(c)**
[before Final Office Action or Allowance] *N/C*

☒ 3. **Fee Payment Pursuant to 37 CFR 1.97(c)**
[before Final Office Action or Allowance] *$240.00*

☐ 4. **Pursuant to 37 CFR 1.97(d)**
[before Issue Fee payment] *$240.00*

The following are submitted in the above-identified application in compliance with 37 C.F.R. §§ 1.97 and 1.98:

☒ 5. A list of documents on Form PTO-1449 together with copies of each identified document and a translation or a concise explanation of each non-English language document is enclosed herewith.

☐ a) The partial translations were provided to the undersigned by the applicants' foreign representative. The undersigned has no knowledge regarding the pertinency of the partially translated portions vis-á-vis the document as a whole. The partial translations are merely provided for whatever convenience they may be.

This paper is submitted in accordance with:

☐ 6. 37 CFR 1.97(b): [within 3 months of filing or prior to 1st Office Action]

☒ 7. 37 CFR 1.97(c): [before Final Office Action or Allowance, whichever is earlier]; and

EX-1002
Ericsson Inc., Nokia v. Active Wireless Technologies
Page 317

☐ a) The required Statement made in item 9 below; or

☒ b) The $240.00 fee specified in 37 CFR §1.17(p) for submission of this Information Disclosure Statement is authorized in item 10 below.

☐ 8. 37 CFR §1.97(d): [before issue fee payment]; and

☐ a) The fee ($240.00) required by 37 CFR §1.17(p) is submitted herewith; and

☐ b) The required Statement is stated in item 9 below.

☐ 9. Statement under 37 CFR 1.97(e)

☐ a) The undersigned attorney of record hereby certifies under 37 C.F.R. §1.97(e) that each item of information contained in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement; or

☐ b) No item of information contained in this Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing this Statement, after making reasonable inquiry, no item of information contained in this Statement was known to any individual designated in 37 CFR §1.56(c) more than three months prior to the filing of this Information Disclosure Statement.

☒ 10. Please charge all deficiency fees associated with the submission of this Information Disclosure Statement and any other fees applicable to this application to Deposit Account No. 14-1140. An original and one (1) copy of this document are enclosed.

Respectfully submitted,
NIXON & VANDERHYE P.C.

By: /H. Warren Burnam, Jr./
H. Warren Burnam, Jr.
Reg. No. 29,366

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/408,922	05/10/2019	Atsushi ISHII	HWB-1035-1395	1156

126613 7590 02/05/2020

NIXON & VANDERHYE, P.C. / SLA
901 N. Glebe Road, 11th Floor
Arlington, VA 22203

EXAMINER	
VIANA DI PRISCO, GERMAN	

ART UNIT	PAPER NUMBER
2642	

NOTIFICATION DATE	DELIVERY MODE
02/05/2020	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PTOMAIL@nixonvan.com
pair_nixon@firsttofile.com

Office Action Summary	Application No. 16/408,922	Applicant(s) ISHII, Atsushi	
	Examiner GERMAN VIANA DI PRISCO	Art Unit 2642	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 12/16/2019.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-8 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-8 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

This Office action is in response to Applicant's amendment filed on 12/16/2019. Claims 1-8 are still pending. This action is made **FINAL**.

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Information Disclosure Statement

The information disclosure statement (IDS) submitted on 1/27/2020 is being considered by the Examiner.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-8 are rejected under 35 U.S.C. 103 as being unpatentable over Johansson et al (Pub. No.: US 2018/0049107 A1, hereinafter Johansson) in view of Yamagishi et al (US 20110275375 A1, hereinafter Yamagishi)

Consider claims 1 and 3, Johansson discloses a method and a user equipment (user equipment UE 201, see Fig. 2 and paragraph 26) that communicates over a radio interface with a base station apparatus (base station eNodeB 202 see Fig. 2 and paragraph 26) of a radio access network (RAN), the user equipment comprising:

processor circuitry configured to initiate a first type system information block (SIB) acquisition process to receive (an SI acquisition circuit 216 that performs system

information acquisition, see Fig. 2 and paragraph 27) a first type SIB (minimum SI, paragraph 29), the first type SIB comprising:

scheduling information of system information (SI) message, the SI message comprising at least one second type SIB) (the minimum SI comprises the MIB and an SI list containing information for acquiring any other SI, paragraph 29); and

an indication of broadcast status for the SI message, the indication indicating broadcasting (For example, the SI list indicates that SIB1-SIB3 are scheduled to be broadcasted with corresponding scheduling information, and SIB4-SIB11 will not be broadcasted periodically, paragraph 30);

receiver circuitry configured to receive the first type SIB (transceiver 213, Fig. 2); and

the processor circuitry further configured to initiate an SI message acquisition process to receive the SI message (As a result, the UE will acquire SIB1-SIB3 via broadcasting reception, and will acquire SIB-SIB11 via on-demand requesting, paragraph 30);

However, Johansson does not expressly disclose wherein the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process.

In the same field of endeavor, Yamagishi discloses wherein the first type SIB acquisition process is initiated upon a failure of the SI message acquisition process (the transmission and reception unit 11 may be configured to receive the MIB included in the broadcast information and to receive the SIB1 included in the broadcast information based on information included in the MIB, and the control unit 12 may be configured to determine that the transmission and reception unit 11 has failed to receive the

broadcast information, when the transmission and reception unit 11 fails to receive the SIB1 after succeeding in receiving the MIB, see paragraph 53; when the control unit 12 determines that the transmission and reception unit 11 has failed to receive the broadcast information, the control unit 12 may be configured to perform, after performing a cell barred process of the cell 2 in a fixed period, a re-establishment process on a cell (for example, a cell 3) other than the cell 2, see paragraph 58).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to combine the teachings Yamagishi with the teachings of Johansson continue communication even if the reception of the broadcast information is failed in a second cell at the time of a handover from a first cell to the second cell.

Consider claims 2 and 4, and as applied to claims 1 and 3 respectively above, Yamagishi discloses wherein the processor circuitry is further configured to re-initiate the SI message acquisition process based on the first type SIB acquisition process being initiated upon the failure of the SI message acquisition process (the transmission and reception unit 11 may be configured to receive the MIB included in the broadcast information and to receive the SIB1 included in the broadcast information based on information included in the MIB, and the control unit 12 may be configured to determine that the transmission and reception unit 11 has failed to receive the broadcast information, when the transmission and reception unit 11 fails to receive the SIB1 after succeeding in receiving the MIB, see paragraph 53; when the control unit 12 determines

that the transmission and reception unit 11 has failed to receive the broadcast information, the control unit 12 may be configured to perform, after performing a cell barred process of the cell 2 in a fixed period, a re-establishment process on a cell (for example, a cell 3) other than the cell 2, see paragraph 58).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to combine the teachings Yamagishi with the teachings of Johansson continue communication even if the reception of the broadcast information is failed in a second cell at the time of a handover from a first cell to the second cell.

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Consider claims 5 and 7, Johansson discloses a method and base station apparatus of a radio access network (RAN) (base station eNodeB 202 see Fig. 2 and paragraph 26) that communicates over a radio interface with a use equipment (user equipment UE 201, see Fig. 2 and paragraph 26) , the base station apparatus comprising:

transmitting circuitry configured to transmit first type system information block (SIB) (transceiver 223, configuration module 225, see Fig. 2 and paragraph 27) a first type SIB (minimum SI, paragraph 29), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB (the minimum SI comprises the MIB and an SI list containing information for acquiring any other SI, paragraph 29); and

an indication of broadcast status for the SI message, the indication indicating broadcasting (For example, the SI list indicates that SIB1-SIB3 are scheduled to be broadcasted with corresponding scheduling information, and SIB4-SIB11 will not be broadcasted periodically, paragraph 30);

processor circuitry configured to use the transmitter circuitry to broadcast the SI message (transceiver 223, Fig. 2)'

However, Johansson does not expressly disclose wherein the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message.

In the same field of endeavor Yamagishi discloses wherein the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process to receive the SI message (the transmission and reception unit 11 may be configured to receive the MIB included in the broadcast information and to receive the SIB1 included in the broadcast information based on information included in the MIB, and the control unit 12 may be configured to determine that the transmission and reception unit 11 has failed to receive the broadcast information, when the transmission and reception unit 11 fails to receive the SIB1 after succeeding in receiving the MIB, see paragraph 53; when the control unit 12 determines that the transmission and reception unit 11 has failed to receive the broadcast information, the control unit 12 may be configured to perform, after performing a cell barred process of the cell 2 in a fixed period, a re-establishment process on a cell (for example, a cell 3) other than the cell 2, see paragraph 58).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to combine the teachings Yamagishi with the teachings of Johansson continue communication even if the reception of the broadcast information is failed in a second cell at the time of a handover from a first cell to the second cell.

Consider claims 6 and 8, and as applied to claims 5 and 7 respectively above, Yamagishi discloses wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process (the transmission and reception unit 11 may be configured to receive the MIB included in the broadcast information and to receive the SIB1 included in the broadcast information based on information included in the MIB, and the control unit 12 may be configured to determine that the transmission and reception unit 11 has failed to receive the broadcast information, when the transmission and reception unit 11 fails to receive the SIB1 after succeeding in receiving the MIB, see paragraph 53; when the control unit 12 determines that the transmission and reception unit 11 has failed to receive the broadcast information, the control unit 12 may be configured to perform, after performing a cell barred process of the cell 2 in a fixed period, a re-establishment process on a cell (for example, a cell 3) other than the cell 2, see paragraph 58).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective filing date of the claimed invention, to combine the teachings Yamagishi with the teachings of Johansson continue communication even if the

reception of the broadcast information is failed in a second cell at the time of a handover from a first cell to the second cell.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP §§ 706.02(l)(1) -

706.02(l)(3) for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

Claims 1-8 are provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-8 of copending Application No. 16/408,853 in view of Johansson .

Claims 1, 3, 5, and 7 of copending Application No. 16/408,853 fall within the scope of claims 1, 3, 5, and 7 of the instant application, however, claims 1, 3, 5, and 7 of the instant application differ from claims 1, 3, 5, and 7 of copending Application No. 16/408,853 in that claims 1, 5, and 7 of the instant application require an indication of broadcast status indicating broadcasting whereas claims 1, 5, and 7 of copending Application No. 16/408,853 require an indication of broadcast status indicating on-demand delivery. Johansson discloses an SI information element indicating whether SI information is scheduled for SI broadcast or obtained on-demand by the UE, see

paragraph 30. Therefore, it would have been obvious to modify the indication of broadcast status to indicate either on-demand or broadcasting based on how the SI information is transmitted in order to inform the UE to acquire the SI information.

Claims 2,4, 6, and 8 of the instant application correspond to claims 2, 4, 6, and 8 of copending Application No. 16/408,853

This is a provisional nonstatutory double patenting rejection.

Response to Arguments

Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GERMAN VIANA DI PRISCO whose telephone number is (571)270-1781. The examiner can normally be reached on Monday through Friday 8:30-5:00 EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, RAFAEL PEREZ-GUTIERREZ can be reached on (571) 272-7915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/GERMAN VIANA DI PRISCO/
Primary Examiner, Art Unit 2642

Notice of References Cited	Application/Control No. 16/408,922	Applicant(s)/Patent Under Reexamination ISHII, Atsushi	
	Examiner GERMAN VIANA DI PRISCO	Art Unit 2642	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20110275375-A1	11-2011	Yamagishi; Hiroaki	H04W36/0055	455/436
*	B	US-20180317264-A1	11-2018	AGIWAL; Anil	H04W52/36	1/1
*	C	US-20190297563-A1	09-2019	Sharma; Vivek	H04W76/18	1/1
	D					
	E					
	F					
	G					
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	I					
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	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	Art Unit
	GERMAN VIANA DI PRISCO	2642

CPC - Searched*		
Symbol	**Date**	**Examiner**
H04W48/10, H04W48/14, H040/24, H04W74/002, H04W74/006 (text search)	08/07/2019	GV

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
EAST Image and keyword search in USPAT, US-PGPUB, DERWENT, EPO, JPO, and IBM_TDB (see attached search strategy)	08/07/2019	GV
Inventor name and Assignee search in PALM ExPO and EAST	08/07/2019	GV
EPO Database(http://ep.espacenet.com)	08/07/2019	GV
Updated search	01/30/2020	GV

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	**Art Unit**
	GERMAN VIANA DI PRISCO	2642

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS										
☐ Claims renumbered in the same order as presented by applicant				☐ CPA		☐ T.D.		☐ R.1.47		
CLAIM		**DATE**								
Final	Original	08/07/2019	01/30/2020							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	✓							

EX-1002
Ericsson Inc., Nokia v. Active Wireless Technologies
Page 334

Sheet 1 of 1

INFORMATION DISCLOSURE CITATION	ATTY. DOCKET NO.	APPLICATION NO.
	181236US_1035-1395	16/408,922
	INVENTOR(S)	
	ISHII	
(Use several sheets if necessary)	FILING DATE	ART UNIT
	May 10, 2019	2642

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
		2019/0364601	11-2019	Kami			
		2019/0349983	11-2019	Loehr			
		2019/0349840	11-2019	Zhang			
		2019/0319764	10-2019	Nader			
		2019/0223154	7-2019	Jia			
		2019/0165984	5-2019	Shapin			
		2018/0310235	10-2018	You			
		2017/0064764	3-2017	Ke			
		2016/017425	6-2016	Zhang			
		2019/0349841	11-2019	Ishii			
		2016/0234736	8-2016	Qualcomm Incorporated			
		2018/0132168	5-2018	Samsung Electronics Co., Ltd.			

FOREIGN PATENT DOCUMENTS

		DOCUMENT	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)

		Notice of Allowance mailed January 13, 2020 in U.S. Patent Application 16/408,853
		International Search Report and Written Opinion mailed 9 August 2019 in PCT Application PCT/US2019/031669

*Examiner	/GERMAN VIANA DI PRISCO/	Date Considered	01/30/2020

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

)

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.V/

2980547

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1359	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 16:16
L2	30	L1 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 16:16
S1	440	sib1 with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/06 17:24
S2	133	sib1 with (includ$3 indicat$3) with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/06 17:24
S3	133	sib1 with (includ$3 indicat$3) with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 09:34
S4	47	S3 and (valid validity)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 09:34
S5	204	sib near3 valid	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 11:00
S6	2	S3 and S5	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 11:03
S7	1306	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT;	OR	ON	2019/08/07 13:16

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S8	15	S7 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:17
S9	10	S7 and sib and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:18
S10	4457	(sharp adj laboratories fg adj innovation)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:25
S11	42	S10 and sib and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:25
S12	39197	(H04W48/10 H04W48/14 H040/24 H04W74/002 H04W74/006).cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:09
S13	554	S12 and sib$1 and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:09
S14	1928	S12 and sib$1 and broadcast$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:11
S15	1348	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/24 13:47
S16	28	S15 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/24 13:47
S17	6	S16 and valid.clm.	US-PGPUB; USPAT;	OR	ON	2020/01/24 14:46

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S18	26	("20160174251" | "20170064764" | "20180310235" | "20190165984" | "20190223154" | "20190319764" | "20190349840" | "20190349841" | "20190349983" | "20190364601" "20160234736" "20180132168").PN.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 16:44
S19	15	("20150038142" "20170325049" "20160234736" "20170064764" "20180132168" "20170251500").PN.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 16:47
S20	4	"2017197063".did.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 16:48
S21	111	(fail$3) with broadcast$3 with sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 10:25
S22	268	(fail$3) with (acquir$3) with (si system adj information)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 10:39
S23	3	(fail$3) with (acquir$3) with (si system adj information) with (try$3 re$1try$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 10:42
S24	33	(fail$3) with (acquir$3) with (sib$1) with (si system adj information)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 11:24
S25	18367	(acquir$3 acquisition) near4 (si system adj information)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 12:59
S26	243	(acquir$3 acquisition) near4 (si system adj information) with fail$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 12:59
S27	64	(acquir$3 acquisition) near4 (sib$1) with fail$3	US-PGPUB; USPAT;	OR	ON	2020/01/30 13:06

			FPRS; EPO; JPO; DERWENT; IBM_TDB			
S28	0	S27 and broadcast3 same3 failure	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:41
S29	0	S27 and broadcast3 same4 failure	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:41
S30	436	fail$3 with broadcast$3 with (si system adj information sib)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:44
S31	127	broadcast$3 with (si system adj information sib) near5 fail$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:48
S32	0	broadcast$3 with (si system adj information sib) near5 fail$3 with (different another) near4 (cell enodeb enb)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 14:14
S33	2	broadcast$3 with (si system adj information sib) near5 fail$3 same (different another) near4 (cell enodeb enb)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 14:15
S34	0	broadcast$3 with (si system adj information sib) near5 fail$3 with re$1select$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 14:16

EAST Search History (Interference)

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1/ 30/ 2020 4:20:04 PM
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REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	16/408,922		
Filing Date	05/10/2019		
First Named Inventor	ISHII, Atsushi		
Group Art Unit	2642	*Conf. No.*	1156
Examiner Name	VIANA DI PRISCO, GERMAN		
Attorney Docket Number	HWB-1035-1395		

This is a Request for Continued Examination (RCE) under 37 C.F.R. §1.114 of the above-identified application.
Request for continued Examination (RCE) practice under 37 C.F.R. § 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO).

1. Submission required under 37 C.F.R. § 1.114.
   - a. ☐ Previously submitted (Note: Any previously filed unentered amendments will be entered unless applicant instructs otherwise. If applicant does not wish to have previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).
     - i. ☐ Consider the amendment(s)/reply under 37 C.F.R. § 1.116 previously filed on _____
     - ii. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
     - iii. ☐ Other _____
   - b. ☒ Enclosed
     - i. ☒ Amendment/Reply
     - ii. ☐ Affidavit(s)/Declaration(s)
     - iii. ☐ Information Disclosure Statement (IDS)
     - iv. ☐ Other _____
2. Miscellaneous
   - a. ☐ Suspension of action on the above-identified application is requested under 37 C.F.R. § 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 C.F.R. § 1.17(i) **required**)
   - b. ☐ Other _____
3. Fees The RCE fee under 37 C.F.R. § 1.17(e) is required by 37 C.F.R. § 1.114 when the RCE is filed.
   - a. ☐ Applicant claims "small entity" status.
     ☐ Applicant claims "micro entity" status. ☐ Micro entity certification statement filed herewith.
   - b. ☒ Fees are attached as calculated below:
     - i. ☒ RCE fee required under 37 C.F.R. § 1.17(e)(1) $1300.00 (1801)/$650.00 (2801)/$325.00 (3801) $ 1300
     - ☐ RCE fee required under 37 C.F.R. § 1.17(e)(2) $1900.00 (1820)/$950.00 (2820)/$475.00 (3820) $
     - ii. ☐ Petition is made to extend the due date ____ months (less ____ months previously paid) $
     - iii. ☐ Other _____ $
   - c. ☐ **CREDIT CARD OR DEPOSIT ACCOUNT PAYMENT (CREDIT CARD FORM ATTACHED IF PAPER FILING) in the amount of $1300.00**
   - d. ☒ The Director is hereby authorized to charge any deficiency in the fee(s) filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm), to Deposit Account No. 14-1140.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Name (Print Type)	H. Warren Burnam, Jr.	*Registration No. (Attorney/Agent)*	29,366
Signature	/H. Warren Burnam, Jr./	*Date*	April 17, 2020

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner For Patents, P.O. Box 1450, Alexandria, VA 22313-1450, or facsimile transmitted to the U.S. Patent and Trademark Office on:

Name (Print Type)			
Signature		*Date*	

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	Atty. Ref.: HWB-1035-1395
ISHII	Confirmation No. 1156
Appl. No. 16/408,922	Art Unit: 2642
Filed: 05/10/2019	Examiner: VIANA DI PRISCO, GERMAN

For: APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATIONS

* * * * * * * * * * * *

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

April 17, 2020

Sir:

AMENDMENT ACCOMPANYING RCE

Responsive to the Final Official Action dated February 5, 2020, and as a Submission in conjunction with the simultaneous filing of a request for continued examination (RCE), please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2.

Remarks/Arguments begin on page 6.

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the user equipment comprising:

receiver ~~processor~~ circuitry configured to ~~initiate a first type system information block (SIB) acquisition process to~~ receive a first type SIB, the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type (SIB), the scheduling information configuring SI windows, the SI windows being periodically occurring time windows in which the SI message is transmitted; and

an indication of broadcast status for the SI message, the indication indicating broadcasting;

~~receiver circuitry configured to receive the first type SIB;~~ and

~~the~~ processor circuitry ~~further~~ configured to:

initiate, based on the indication, an SI message acquisition process in at least one of the SI windows to receive the SI message; ~~wherein~~ and

to initiate ~~the~~ a ~~first type SIB~~ re-acquisition process to re-acquire the first type SIB~~is initiated~~ upon a failure of the SI message acquisition process.

2. (Currently Amended) The user equipment of claim 1, wherein the processor circuitry is further configured to re-initiate the SI message acquisition process based on the ~~first type SIB~~ re-acquisition process being initiated upon the failure of the SI message acquisition process.

3. (Currently Amended) A method for a user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the method comprising:

receiving ~~initiating~~ a first type system information block (SIB) ~~acquisition process to receive a first type SIB~~, the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows being periodically occurring time windows in which the SI message is transmitted; and

an indication of broadcast status for the SI message, the indication indicating broadcasting;

~~receiving the first type SIB; and~~

initiating, based on the indication, an SI message acquisition process in at least one of the SI windows to receive the SI message; ~~whereinand~~

~~the~~ initiating a ~~first type SIB~~ re-acquisition process ~~is initiated~~ to re-acquire the first type SIB upon a failure of the SI message acquisition process.

4. (Currently Amended) The method of claim 3, further comprising re-initiating the SI message acquisition process based on the ~~first type SIB~~ re-acquisition process being initiated upon the failure of the SI message acquisition process.

5. (Currently Amended) A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:

transmitting circuitry configured to transmit first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows being periodically occurring time windows in which the SI message is transmitted; and

an indication of broadcast status for the SI message, the indication indicating broadcasting;

processor circuitry configured to use the transmitter circuitry to broadcast the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process in at least one of the SI windows to receive the SI message.

6. (Original) The base station apparatus of claim 5, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

7. (Currently Amended) A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, comprising:

transmitting first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows being periodically occurring time windows in which the SI message is transmitted; and

an indication of broadcast status for the second type SI message, the indication indicating broadcasting;

broadcasting the SI message; wherein

the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process in at least one of the SI windows to receive the SI message.

8. (Original) The method of claim 7, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

REMARKS/ARGUMENTS

Reconsideration of the captioned application is respectfully requested.

A. SUMMARY OF THIS AMENDMENT

By the current amendment, Applicant basically:

1. Amends independent claims 1 - 5, and 7.
2. Respectfully traverses the double patenting rejection.
3. Respectfully traverses all prior art rejections.

B. THE PRIOR ART REJECTIONS

Claims 1-8 stand rejected under 35 U.S.C. 103 as allegedly being unpatentable over US 2018/0049107 to Johansson et al in view of US 20110275375 to Yamagishi et al. All prior art rejections are respectfully traversed for at least the following reasons.

C. PATENTABILITY OF THE CLAIMS

Both independent claims 1 and 3, which respectively pertain to a user equipment and a method in a user equipment, include a limitation pertaining to initiation of re-acquisition process upon a failure of the SI message acquisition process. The amendatory limitations are supported, e.g., by ¶[0087] and ¶[0108] of the specification as filed. Independent claims 5 and 7, which pertain to a base station, include a limitation which specifies that the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process in at least one of the SI windows to receive the SI message.

The final office action correctly acknowledges that US 2018/0049107 to Johansson does not explicitly disclose the first type SIB acquisition process being initiated upon a failure of a SI message acquisition process. Final office action, page 3. However, the final office action rejects all claims over a combination of Johansson with US 20110275375 to Yamagishi, alleging that the limitation lacking in Johansson resides in Yamagishi. The final office action particularly notes Yamagishi paragraph [0058].

Applicant respectfully submits that US 20110275375 to Yamagishi does not teach what is attributed by the final office action. As a result, and as explained below, the prior art rejections are erroneous.

Paragraph [0058] of US 20110275375 to Yamagishi, relied on by the final office action, reads at least in part as follows:

> "when the control unit 12 determines that the transmission and reception unit 11 has failed to receive the broadcast information, the control unit 12 may be configured to perform, after performing a cell barred process of the cell 2 in a fixed period, a re-establishment process on a cell (for example, a cell3) other than the cell 2." Yamagishi ¶[0058], emphasis added.

US 20110275375 to Yamagishi does not explain his "re-establishment process" in detail. However, the Yamagishi process appears to involve re-establishing connection with another cell, e.g., cell 3 rather than cell 2, particularly since 2 is now barred. See also Yamagishi ¶[0025] - ¶[0025] and ¶[0029] - ¶[0033], ¶[0047], ¶[0050], and ¶[0060] - ¶[0061]. Since the system information differs from one cell to the next, it cannot be concluded from US 20110275375 to Yamagishi that the "re-establishment process" is for reacquisition of the first type SIB corresponding to that which was previously received. Therefore, the combination of Johansson and US 20110275375 to Yamagishi fails to realize all the limitations of the independent claims.

D. NO DOUBLE PATENTING

Applicant also respectfully traverses the double patenting rejection formulated with reference to application 16/408,853 in view of Johansson. In conjunction with the traversal, Applicant notes that each of the independent claims has been amended to further recite that the scheduling information configures SI windows, the SI windows being periodically occurring time windows in which the SI message is transmitted. The amendatory limitation is fully supported by the original disclosure, including for example

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paragraph [0062] of the specification as filed. Applicant respectfully submits that the subject matter of the pending independent claims as amended patentably defines over the independent claims of application 16/408,853, and therefore that the double patenting rejection should be withdrawn.

E. MISCELLANEOUS

In view of the foregoing and other considerations, all claims are deemed in condition for allowance. A formal indication of allowability is earnestly solicited.

Applicant does not acquiesce as to any assertion in the office action, including but not limited to any assertion with respect to the prior art or to Applicant's claims. Applicant's silence with respect to any assertion in the office action should not be interpreted as Applicant's acquiescence thereto. Applicant reserves the right to comment further with respect to the applied references and any pending claim in a future Amendment, Response, or on appeal.

The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

Should the Examiner feel that an interview with the undersigned would facilitate allowance of this application, the Examiner is encouraged to contact the undersigned.

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Page 348

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: /H. Warren Burnam, Jr./

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Page 349

Electronic Patent Application Fee Transmittal

Application Number:	16408922
Filing Date:	10-May-2019
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Filer:	H. Warren Burnam
Attorney Docket Number:	HWB-1035-1395

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
RCE- 1ST REQUEST	1801	1	1300	1300
		Total in USD ($)		**1300**

Electronic Acknowledgement Receipt

EFS ID:	39187676
Application Number:	16408922
International Application Number:	
Confirmation Number:	1156
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Customer Number:	126613
Filer:	H. Warren Burnam
Filer Authorized By:	
Attorney Docket Number:	HWB-1035-1395
Receipt Date:	17-APR-2020
Filing Date:	10-MAY-2019
Time Stamp:	11:04:13
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1300
RAM confirmation Number	E20204GB04311414
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	181236US_1035-1395_RCE_transmittal_2020_April_17.pdf	119533 ad34b33a9d94071bb26c6f25e33633c702c6a8c3	no	1
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2		181236US_1035-1395_amd_RCE_2020_April_17.pdf	161973 4b5b9b86b40c42d7b67ae9c0ecdc935c5d36d9f5	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment Submitted/Entered with Filing of CPA/RCE	1	1
	Claims	2	5
	Applicant Arguments/Remarks Made in an Amendment	6	9

Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30337 89dd22dbff0e19402b162c5ad26f2a7b2ff911d6	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	311843		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/408,922	Filing Date 05/10/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	04/17/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 8	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 4	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/TRINA RIDDICK/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/408,922	05/10/2019	Atsushi ISHII	HWB-1035-1395	1156

126613 7590 09/15/2020

NIXON & VANDERHYE, P.C. / SLA
901 N. Glebe Road, 11th Floor
Arlington, VA 22203

EXAMINER	
VIANA DI PRISCO, GERMAN	

ART UNIT	PAPER NUMBER
2642	

NOTIFICATION DATE	DELIVERY MODE
09/15/2020	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PTOMAIL@nixonvan.com
pair_nixon@firsttofile.com

Office Action Summary	**Application No.** 16/408,922	**Applicant(s)** ISHII, Atsushi	
	Examiner GERMAN VIANA DI PRISCO	**Art Unit** 2642	**AIA (FITF) Status** Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 4/17/2020.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-8 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-8 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/17/2020 has been entered.

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Objections

Claim 1 is objected to because of the following informalities: in line 3, “receiver circuitry configured to receive a fist type SIB, the first type SIB comprising:” should read -- receiver circuitry configured to receive a fist type system information block (SIB), the first type SIB comprising:--. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-8 are rejected under 35 U.S.C. 103 as being unpatentable over a Agiwal et al (US 20170251500 A1, hereinafter Agiwal) in view of Subramanian et al (US 20180332521 A1, hereinafter Subramanian).

Consider claims 1 and 3, Agiwal discloses a method and a user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the user equipment comprising:

receiver circuitry (The UE includes a transceiver configured to transmit and receive a signal, paragraph 18) configured to receive a first type SIB (first category, also referred as minimum SI, paragraph 48), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type (SIB), the scheduling information configuring SI windows, the SI windows being periodically occurring time windows in which the SI message is transmitted (Network signals in first category of system information i.e. in Minimum SI or essential SI whether the system information in the second category is periodically broadcasted or provided on demand, paragraph 50; The scheduling information for other SI including SIB type, validity information, periodicity, SI-window information can be provided in minimum SI, paragraph 59); and

an indication of broadcast status for the SI message, the indication indicating broadcasting (UE acquires first category (also referred as minimum SI or essential SI) from broadcasted information. Network signals in first category of system information i.e. in Minimum SI or essential SI whether the system information in the second category is periodically broadcasted or provided on demand, paragraph 50); and

processor circuitry (The UE includes at least one processor, paragraph 18) configured to:

initiate, based on the indication, an SI message acquisition process in at least one of the SI windows to receive the SI message (UE first checks for SI response in SI

response window and if not received it monitors the SI window for receiving the requested Sis, paragraph 59).

However, Agiwal does not expressly disclose initiating a re-acquisition process to re-acquire the first type SIB upon a failure of the SI message acquisition process.

In the same field of endeavor, Subramanian discloses initiating a re-acquisition process to re-acquire the first type SIB upon a failure of the SI message acquisition process (during the attempted cell selection of the second radio cell 202, the mobile terminal 203 faces an SI Acquisition failure, paragraph 63; if the target cell is still a candidate for selection (e.g. based on the 3GPP conditions), the mobile terminal 203 triggers another selection attempt to the target cell, paragraph 66).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective fling date of the claimed invention, to combine the teachings of Subramanian with the teachings of Agiwal to set the timing of a selection or reselection after a failed selection or reselection attempt.

Consider claims 2 and 4 and as applied to claims 1 and 3 respectively above, Subramanian discloses wherein the processor circuitry is further configured to re-initiate the SI message acquisition process based on the re-acquisition process being initiated upon the failure of the SI message acquisition process (as per steps 405-409 in Fig. 4, if there is an SI acquisition failure, the mobile terminal 203 triggers another selection attempt to the target cell, see paragraph 66-70).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective fling date of the claimed invention, to combine the teachings of

Subramanian with the teachings of Agiwal to set the timing of a selection or reselection after a failed selection or reselection attempt.

Consider claims 5 and 7, Agiwal discloses a method and a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:

transmitting circuitry (a base station includes a transceiver configured to transmit and receive a signal, paragraph 19) configured to transmit first type system information block (SIB) (first category, also referred as minimum SI, paragraph 48), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows being periodically occurring time windows in which the SI message is transmitted (Network signals in first category of system information i.e. in Minimum SI or essential SI whether the system information in the second category is periodically broadcasted or provided on demand, paragraph 50; The scheduling information for other SI including SIB type, validity information, periodicity, SI-window information can be provided in minimum SI, paragraph 59); and

an indication of broadcast status for the SI message, the indication indicating broadcasting (UE acquires first category (also referred as minimum SI or essential SI) from broadcasted information. Network signals in first category of system information i.e. in Minimum SI or essential SI whether the system information in the second category is periodically broadcasted or provided on demand, paragraph 50);

processor circuitry (The base station includes at least one processor, paragraph 19) configured to use the transmitter circuitry to broadcast the SI message (in operation S110. If first category (also referred as minimum SI or essential SI) of system information indicates that SI which UE wants to acquire is not periodically broadcasted (or provided on demand) then UE sends request to base station (BS) to receive that SI, see Fig. 1 and paragraph 54).

However, Agiwal does not expressly disclose wherein the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process in at least one of the SI windows to receive the SI message.

In the same field of endeavor, Subramanian discloses wherein the first type SIB is re-acquired by the user equipment upon the user equipment failing on an SI message acquisition process in at least one of the SI windows to receive the SI message (during the attempted cell selection of the second radio cell 202, the mobile terminal 203 faces an SI Acquisition failure, paragraph 63; if the target cell is still a candidate for selection (e.g. based on the 3GPP conditions), the mobile terminal 203 triggers another selection attempt to the target cell, paragraph 66).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective fling date of the claimed invention, to combine the teachings of Subramanian with the teachings of Agiwal to set the timing of a selection or reselection after a failed selection or reselection attempt.

Consider claims 6 and 8 and as applied to claims 5 and 7 respectively above, Subramanian discloses wherein the first type SIB re-acquired by the user equipment is

used by the user equipment to re-initiate the SI message acquisition process (as per steps 405-409 in Fig. 4, if there is an SI acquisition failure, the mobile terminal 203 triggers another selection attempt to the target cell, see paragraph 66-70).

Therefore, it would have been obvious to a person of ordinary skill in the art, before the effective fling date of the claimed invention, to combine the teachings of Subramanian with the teachings of Agiwal to set the timing of a selection or reselection after a failed selection or reselection attempt.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory

double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

Claims 1-8 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-8 of U.S. Patent No.10,660,023 in view of Agiwal. Although the claims at issue are not identical, they are not patentably distinct from each other because claims 1, 3, 5, and 7 of U.S. Patent No.10,660,023 fall within the scope of claims 1, 3, 5, and 7 of the instant application, however, claims 1, 3, 5, and 7 of the instant application differ from claims 1, 3, 5, and 7 of U.S. Patent No.10,660,023 in that claims 1, 5, and 7 of the instant application specify the scheduling information configuring SI windows, the SI windows being periodically occurring time windows in

which the SI message is transmitted; and the indication indicating broadcasting. Agiwal discloses the scheduling information configuring SI windows, the SI windows being periodically occurring time windows in which the SI message is transmitted (Network signals in first category of system information i.e. in Minimum SI or essential SI whether the system information in the second category is periodically broadcasted or provided on demand, see paragraph 50); and the indication indicating broadcasting (UE acquires first category (also referred as minimum SI or essential SI) from broadcasted information. Network signals in first category of system information i.e. in Minimum SI or essential SI whether the system information in the second category is periodically broadcasted or provided on demand, see paragraph 50). One of ordinary skill in the art it would have been obvious to combine the teachings of Subramanian with the teachings of Agiwal to set the timing of a selection or reselection after a failed selection or reselection attempt.

Claims 2, 4, 6, and 8 of the instant application correspond to claims 2, 4, 6, and 8 of U.S. Patent No.10,660,023.

Response to Arguments

Applicant's arguments with respect to claims 1-8 have been considered but are moot because the new ground of rejection does not rely on any reference applied in the prior rejection of record for any teaching or matter specifically challenged in the argument.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GERMAN VIANA DI PRISCO whose telephone number

is (571)270-1781. The examiner can normally be reached on Monday through Friday 8:30-5:00 EST.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, RAFAEL PEREZ-GUTIERREZ can be reached on (571) 272-7915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see https://ppair-my.uspto.gov/pair/PrivatePair. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/GERMAN VIANA DI PRISCO/
Primary Examiner, Art Unit 2642

Notice of References Cited	Application/Control No. 16/408,922	Applicant(s)/Patent Under Reexamination ISHII, Atsushi	
	Examiner GERMAN VIANA DI PRISCO	Art Unit 2642	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20170251500-A1	08-2017	AGIWAL; Anil	H04W48/12	1/1
*	B	US-20180332521-A1	11-2018	Subramanian; Kumaran	H04W36/305	1/1
	C					
	D					
	E					
	F					
	G					
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	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	**Art Unit**
	GERMAN VIANA DI PRISCO	2642

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/07/2019	01/30/2020	09/01/2020						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	✓						
	7	✓	✓	✓						
	8	✓	✓	✓						

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	Art Unit
	GERMAN VIANA DI PRISCO	2642

CPC - Searched*		
Symbol	**Date**	**Examiner**
H04W48/10, H04W48/14, H040/24, H04W74/002, H04W74/006 (text search)	08/07/2019	GV

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
EAST Image and keyword search in USPAT, US-PGPUB, DERWENT, EPO, JPO, and IBM_TDB (see attached search strategy)	08/07/2019	GV
Inventor name and Assignee search in PALM ExPO and EAST	08/07/2019	GV
EPO Database(http://ep.espacenet.com)	08/07/2019	GV
Updated search	01/30/2020	GV
Updated search	09/01/2020	GV

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	Art Unit
	GERMAN VIANA DI PRISCO	2642

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1,414	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/09/01 10:49
L2	36	L1 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/09/01 10:49
L3	12	L1 and sib.clm.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/09/01 10:52
S1	440	sib1 with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/06 17:24
S2	133	sib1 with (includ$3 indicat$3) with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/06 17:24
S3	133	sib1 with (includ$3 indicat$3) with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 09:34
S4	47	S3 and (valid validity)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 09:34

S5	204	sib near3 valid	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 11:00
S6	2	S3 and S5	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 11:03
S7	1,306	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:16
S8	15	S7 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:17
S9	10	S7 and sib and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:18
S10	4,457	(sharp adj laboratories fg adj innovation)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:25
S11	42	S10 and sib and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:25
S12	39,197	(H04W48/10 H04W48/14 H040/24 H04W74/002 H04W74/006).cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:09

S13	554	S12 and sib$1 and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:09
S14	1,928	S12 and sib$1 and broadcast$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:11
S15	1,348	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/24 13:47
S16	28	S15 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/24 13:47
S17	6	S16 and valid.clm.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/24 14:46
S18	26	("20160174251" | "20170064764" | "20180310235" | "20190165984" | "20190223154" | "20190319764" | "20190349840" | "20190349841" | "20190349983" | "20190364601" "20160234736" "20180132168").PN.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 16:44
S19	15	("20150038142" "20170325049" "20160234736" "20170064764" "20180132168" "20170251500").PN.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 16:47
S20	4	"2017197063".did.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 16:48

S21	111	(fail$3) with broadcast$3 with sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 10:25
S22	268	(fail$3) with (acquir$3) with (si system adj information)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 10:39
S23	3	(fail$3) with (acquir$3) with (si system adj information) with (try$3 re$1try$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 10:42
S24	33	(fail$3) with (acquir$3) with (sib$1) with (si system adj information)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 11:24
S25	18,367	(acquir$3 acquisition) near4 (si system adj information)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 12:59
S26	243	(acquir$3 acquisition) near4 (si system adj information) with fail$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 12:59
S27	64	(acquir$3 acquisition) near4 (sib$1) with fail$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:06
S28	0	S27 and broadcast3 same3 failure	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:41

S29	0	S27 and broadcast3 same4 failure	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:41
S30	436	fail$3 with broadcast$3 with (si system adj information sib)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:44
S31	127	broadcast$3 with (si system adj information sib) near5 fail$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:48
S32	0	broadcast$3 with (si system adj information sib) near5 fail$3 with (different another) near4 (cell enodeb enb)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 14:14
S33	2	broadcast$3 with (si system adj information sib) near5 fail$3 same (different another) near4 (cell enodeb enb)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 14:15
S34	0	broadcast$3 with (si system adj information sib) near5 fail$3 with re$1select$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 14:16
S35	1,359	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 16:16
S36	30	S35 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 16:16

S37	1,412	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/29 17:27
S38	36	S37 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/29 17:27
S39	1	"16408922"	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/30 16:45
S40	38	(US-20190223145-$ or US-20180035342-$ or US-20190223082-$ or US-20180324682-$ or US-20180324679-$ or US-20180124685-$ or US-20150173054-$ or US-20110171929-$ or US-20180049107-$ or US-20190045379-$ or US-20180035468-$ or US-20190349841-$ or US-20190349844-$ or US-20180132168-$ or US-20170325049-$ or US-20170251500-$ or US-20170064764-$ or US-20160234736-$ or US-20150038142-$ or US-20190364601-$ or US-20190349983-$ or US-20190349840-$ or US-20190319764-$ or US-20190223154-$ or US-20190165984-$ or US-20180310235-$).did. or (US-20190387461-$ or US-20190387456-$ or US-20190297563-$ or US-20190239059-$ or US-20190349822-$ or US-20140315549-$ or US-20180049159-$ or US-20180007525-$ or US-20180317264-$ or US-20190297562-$ or US-20110275375-$).did. or (WO-2017197063-$).did.	US-PGPUB; FPRS	OR	ON	2020/08/30 17:02
S41	18	S40 and si near4 window	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/30 17:02

S43	51	(fail$3) with (receiv$3 obtain$3) with (minimum adj (si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 13:32
S44	0	(re$1try$3 try$3 adj again) with (minimum adj (si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 13:40
S45	14	(re$1try$3 try$3 adj again re$1acqui$5 re$1establish$4) with (minimum adj (si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 13:41
S46	7,638	(fail$3 rlf) with ((si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 13:46
S47	18	(fail$3 rlf) near3 (during) adj4((si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 13:47
S48	12,356	(window) with ((si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 14:01
S49	2,669	(window) near2 ((si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 14:03
S50	984	S49 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 14:10

S51	522	si$1window	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 14:12
S52	41	(US-20190223145-$ or US-20180035342-$ or US-20190223082-$ or US-20180324682-$ or US-20180324679-$ or US-20180124685-$ or US-20150173054-$ or US-20110171929-$ or US-20180049107-$ or US-20190045379-$ or US-20180035468-$ or US-20190349841-$ or US-20190349844-$ or US-20180132168-$ or US-20170325049-$ or US-20170251500-$ or US-20170064764-$ or US-20160234736-$ or US-20150038142-$ or US-20190364601-$ or US-20190349983-$ or US-20190349840-$ or US-20190319764-$ or US-20190223154-$ or US-20190165984-$ or US-20180310235-$).did. or (US-20190387461-$ or US-20190387456-$ or US-20190297563-$ or US-20190239059-$ or US-20190349822-$ or US-20140315549-$ or US-20180049159-$ or US-20180007525-$ or US-20180317264-$ or US-20190297562-$ or US-20110275375-$ or US-20180332521-$ or US-20200275522-$ or US-20200275477-$).did. or (WO-2017197063-$).did.	US-PGPUB; FPRS	OR	ON	2020/08/31 14:12
S53	13	S51 and S52	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 14:12
S54	544	scheduling with si adj window	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 15:38

EAST Search History (Interference)

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9/1/2020 10:57:11 AM
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Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	16/408922
Filing Date	05/10/2019
First Named Inventor	Atsushi ISHII
Title	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
Art Unit	2642
Examiner Name	VIANA DI PRISCO, GERMAN
Attorney Docket Number	US83349

SIGNATURE of Applicant or Patent Practitioner

Signature	/Alvin Koan/	Date (Optional)	2020-12-11
Name	Alvin Koan	Registration Number	68468
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)	SHARP KABUSHIKI KAISHA, FG INNOVATION COMPANY LIMITED		

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☑ *Total of 1 forms are submitted.

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Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
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I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

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☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 145688

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

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☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

SHARP KABUSHIKI KAISHA

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	/Mototaka Taneya/	Date (Optional)	
Name	Mototaka Taneya		
Title	MANAGING OFFICER BU PRESIDENT CORPORATE RESEARCH & DEVELOPMENT		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

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Application Number	Filing Date

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☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box)

FG Innovation Company Limited

☐ Inventor or Joint Inventor (title not required below)
☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	Chie Ming Chou	Date (Optional)	2020-07-29
Name	CHIE-MING CHOU		
Title	CEO		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

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Electronic Acknowledgement Receipt

EFS ID:	41368010
Application Number:	16408922
International Application Number:	
Confirmation Number:	1156
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Customer Number:	126613
Filer:	Alvin Sean Koan
Filer Authorized By:	
Attorney Docket Number:	HWB-1035-1395
Receipt Date:	11-DEC-2020
Filing Date:	10-MAY-2019
Time Stamp:	20:31:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	US83349201211POA.pdf	1045035 0e0b4627f627e79ba61e2820f6ea63e38e9ed3df	no	3
Warnings:					

Information:	
Total Files Size (in bytes):	1045035

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New International Application Filed with the USPTO as a Receiving Office
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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/408,922	Filing Date 05/10/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	12/14/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 16	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 4	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/VINCENT S BUTLER/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

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EFS ID:	41382402
Application Number:	16408922
International Application Number:	
Confirmation Number:	1156
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Customer Number:	145688
Filer:	Alvin Sean Koan
Filer Authorized By:	
Attorney Docket Number:	HWB-1035-1395
Receipt Date:	14-DEC-2020
Filing Date:	10-MAY-2019
Time Stamp:	19:41:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	US83349201214R1.pdf	153895 133a8ad17870453bd20253972d16c7add18209d4	no	13

Warnings:

Information:	
Total Files Size (in bytes):	153895

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	16/408,922
Application Filing Date	:	May 10, 2019
Examiner	:	VIANA DI PRISCO, GERMAN
Art Unit	:	2642
Confirmation No.	:	1156
Attorney Docket No.	:	US83349
First Inventor	:	ATUSHI ISHII
Customer No.	:	145688

AMENDMENT AND RESPONSE TO *NON-FINAL* OFFICE ACTION

Mail Stop Amendment
Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Sir/Madam:

This is in response to the *Non-Final* Office Action dated September 15, 2020 in the above-referenced patent application. Please kindly enter and consider the following amendments and remarks.

Listing of Claims begins on page **2** of this paper.

Remarks begin on page **7** of this response.

Listing of Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the user equipment comprising:

receiver circuitry configured to receive a first type [[SIB]]system information block (SIB) from the base station apparatus that is a current serving access node of the user equipment, the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows ~~being~~ comprising periodically occurring time windows in which the SI message is transmitted;

a parameter associated with a condition for determination of a failure of an SI message acquisition process; and

an indication of broadcast status for the SI message, the indication indicating broadcasting; and

processor circuitry configured to:

initiate, based on the indication, [[an]]the SI message acquisition process in at least one of the SI windows to receive the SI message from the base station apparatus; and

[[to]]initiate a re-acquisition process to re-acquire the first type SIB from the base station apparatus upon [[a]]the failure of the SI message acquisition process.

2. (Currently Amended) The user equipment of claim 1, wherein the processor circuitry is further configured to re-initiate the SI message acquisition process based on the re-acquisition process [[being]]initiated upon the failure of the SI message acquisition process.

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3. (Currently Amended) A method for a user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the method comprising:

receiving a first type system information block (SIB) from the base station apparatus that is a current serving access node of the user equipment, the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows ~~being~~ comprising periodically occurring time windows in which the SI message is transmitted;

a parameter associated with a condition for determination of a failure of an SI message acquisition process; and

an indication of broadcast status for the SI message, the indication indicating broadcasting;

initiating, based on the indication, [[an]]the SI message acquisition process in at least one of the SI windows to receive the SI message from the base station apparatus; and

initiating a re-acquisition process to re-acquire the first type SIB from the base station apparatus upon [[a]]the failure of the SI message acquisition process.

4. (Currently Amended) The method of claim 3, further comprising re-initiating the SI message acquisition process based on the re-acquisition process [[being]]initiated upon the failure of the SI message acquisition process.

5. (Currently Amended) A base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the base station apparatus comprising:

transmitting circuitry configured to transmit a first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows ~~being~~ comprising periodically occurring time windows in which the SI message is transmitted;

a parameter associated with a condition for determination of a failure of an SI message acquisition process; and

an indication of broadcast status for the SI message, the indication indicating broadcasting; and

processor circuitry configured ~~to use~~to cause the ~~transmitter~~ transmitting circuitry to broadcast the SI message; wherein:

the first type SIB is re-acquired by the user equipment upon the user equipment failing on [[an]]the SI message acquisition process in at least one of the SI windows to receive the SI message,

the base station apparatus is a current serving access node of the user equipment.

6. (Currently Amended) The base station apparatus ~~appratus~~ of claim 5, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

7. (Currently Amended) A method for a base station apparatus of a radio access network (RAN) that communicates over a radio interface with a user equipment, the method comprising:

transmitting a first type system information block (SIB), the first type SIB comprising:

scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows ~~being~~ comprising periodically occurring time windows in which the SI message is transmitted;

a parameter associated with a condition for determination of a failure of an SI message acquisition process; and

an indication of broadcast status for the ~~second type~~ SI message, the indication indicating broadcasting; and

broadcasting the SI message; wherein:

the first type SIB is re-acquired by the user equipment upon the user equipment failing on [[an]]the SI message acquisition process in at least one of the SI windows to receive the SI message,

the base station apparatus is a current serving access node of the user equipment.

8. **(Original)** The method of claim 7, wherein the first type SIB re-acquired by the user equipment is used by the user equipment to re-initiate the SI message acquisition process.

9. **(New)** The user equipment of claim 1, wherein the processor circuitry is further configured to re-acquire a master information block (MIB) from the base station apparatus prior to the re-acquisition of the first type SIB.

10. **(New)** The user equipment of claim 1, wherein the condition for the determination of the failure of the SI message acquisition process includes that a stored version of one of the at least one second type SIB is not valid.

11. **(New)** The method of claim 3, further comprising re-acquiring a master information block (MIB) from the base station apparatus prior to the re-acquisition of the first type SIB.

12. **(New)** The method of claim 3, wherein the condition for the determination of the failure of the SI message acquisition process includes that a stored version of one of the at least one second type SIB is not valid.

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13. **(New)** The base station apparatus of claim 5, wherein a master information block (MIB) is re-acquired by the user equipment from the base station apparatus prior to the re-acquisition of the first type SIB.

14. **(New)** The base station apparatus of claim 5, wherein the condition for the determination of the failure of the SI message acquisition process includes that a stored version of one of the at least one second type SIB is not valid.

15. **(New)** The method of claim 7, wherein a master information block (MIB) is re-acquired by the user equipment from the base station apparatus prior to the re-acquisition of the first type SIB.

16. **(New)** The method of claim 7, wherein the condition for the determination of the failure of the SI message acquisition process includes that a stored version of one of the at least one second type SIB is not valid.

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REMARKS

Prior to the present Amendment and Response, claims 1-8 were pending in the present application. By the present Amendment and Response, claims 1-7 are amended. Claims 9-16 are newly added. Support for the amendments can be found, at least, in paragraphs [0105], [0108] and [0109] of the originally filed application. No new matter has been introduced. After the present Amendment and Response, claims 1-16 remain pending in the present application.

Applicant respectfully requests reconsideration and allowance of claims in view of the above amendments. As Applicant's remarks and/or amendments are sufficient to overcome the cited art of record, Applicant's silence as to assertions by the Examiner in the Office Action or certain requirements that may be applicable to such rejections (for example, assertions regarding dependent claims, whether a reference constitutes prior art, and whether references are legally combinable for obviousness purposes) is not a concession by Applicant that such assertions are accurate or such requirements have been met, and Applicant reserves the right to analyze and dispute such in the future.

A. Claim Objections

In the *Non-Final* Office Action dated September 15, 2020 (hereinafter "Office Action"), the Examiner states that "claim 1 is objected because of the following informalities: in line 3, receiver circuitry configured to receive a fist type SIB, the first type SIB comprising: should read -- receiver circuitry configured to receive a fist type system information block (SIB), the first type SIB comprising:--".

Applicant has amended claim 1 to address and overcome the informality noted by the Examiner. Therefore, withdrawn of the objection is respectfully requested.

B. Rejection of Claims 1-8 under 35 U.S.C. § 103

In the Office Action, the Examiner rejects claims 1-8 under 35 U.S.C. 103 as being unpatentable over Agiwal et al. (U.S. Patent Application Publication 2017/0251500) (hereinafter "Agiwal") in view of Subramanian et al. (U.S. Patent Application Publication 2018/0332521) (hereinafter "Subramanian").

Applicant respectfully traverses the rejections, each finding of fact, including each assertion regarding what the references show or teach, any rationales for modifying and/or combining the references, and any implicit and/or explicit reliance on the Office Action, and Applicant does not acquiesce in the validity of the rejections. In addition, Applicant is not conceding in this application that the previously pending claims are not patentable. Rather, any alterations are without conceding to the Examiner's positions, and being made only to expedite prosecution of the present application, and are without prejudice to the presentation or assertion, in the future, of claims relating to the same or similar subject matter as the previously pending claims.

By the present Amendment and Response, Applicant has amended independent claim 1 to recite:

> A user equipment that communicates over a radio interface with a base station apparatus of a radio access network (RAN), the user equipment comprising:
> receiver circuitry configured to receive a first type system information block (SIB) from the base station apparatus that is a current serving access node of the user equipment, the first type SIB comprising:
> scheduling information of a system information (SI) message, the SI message comprising at least one second type SIB, the scheduling information configuring SI windows, the SI windows comprising periodically occurring time windows in which the SI message is transmitted;
> a parameter associated with a condition for determination of a failure of an SI message acquisition process; and
> an indication of broadcast status for the SI message, the indication indicating broadcasting; and
> processor circuitry configured to:

> initiate, based on the indication, the SI message acquisition process in at least one of the SI windows to receive the SI message from the base station apparatus; and
>
> initiate a re-acquisition process to re-acquire the first type SIB from the base station apparatus upon the failure of the SI message acquisition process.

Support for the amendments can be found in the originally filed application.

The Examiner acknowledges that Agiwal does not expressly disclose the feature "initiate a re-acquisition process to re-acquire the first type SIB upon a failure of the SI message acquisition process" recited in the original claim 1. The Examiner further relies on paragraphs [0063] and [0066] of Subramanian for rejecting the above-quoted feature. *See* page 4 of the Office Action.

Turning to Subramanian, Subramanian describes a method for performing cell selection or reselection. Subramanian states:

> [0059] With respect to scenario (b) SI Acquisition failure in a target cell during selection a mobile terminal 203 for example performs a selection attempt to the second radio cell 202 without being currently camping on the first radio cell 201 (e.g. for initial selection of radio cell after switching on the mobile terminal 203).
>
> [0060] FIG. 4 shows a flow diagram 400 illustrating a procedure for cell selection which the mobile terminal 203 may for example perform.
>
> [0061] The procedure starts in 401.
>
> [0062] In 401, the mobile terminal 203 attempts to select the second radio cell 202 (cell B), i.e. to camp on the second radio cell 203.
>
> [0063] It is assumed that in 403, during the attempted cell selection of the second radio cell 202, the mobile terminal 203 faces an SI Acquisition failure (i.e. a failure to read mandatory SIBs within a predefined time period).
>
> [0064] Therefore, in 404, the mobile terminal 203 measures and stores the RSSNR, the RSRP and the RSRQ values of the target cell.
>
> [0065] The mobile terminal 203 continues to perform measurements on the target cell.
>
> [0066] In 405, if, at the next measurement for the target cell, if the target cell is still a candidate for selection (e.g. based on the 3GPP conditions), the mobile terminal 203 triggers another selection attempt to the target cell in 406 only if the additional condition that the RSSNR measured for the target cell (with the current measurement) is above the RSSNR stored for the target cell in 404 is fulfilled.

As cited above, Subramanian describes a procedure for cell selection in FIG. 4. The mobile terminal 203 is currently not camping on the first radio cell 201. The mobile terminal 203 faces an SI Acquisition failure (i.e. a failure to read mandatory SIBs within a predefined time period) during the attempted cell selection of the second radio cell 202. The mobile terminal 203 triggers another selection attempt to the target cell only if the RSSNR measured for the target cell is above the RSSNR stored for the target cell.

Subramanian merely describes SI acquisition failure during an attempted cell selection and a triggering condition (RSSNR) for another cell selection attempt. However, Subramanian does not disclose **re-acquiring the SIB1 or the minimum SI** when the SI Acquisition failure occurs. Thus, Subramanian fails to disclose, teach or suggest, at least, "initiate a re-acquisition process to ***re-acquire the first type SIB*** from the base station apparatus upon the failure of the SI message acquisition process," as recited in amended independent claim 1.

Moreover, in Subramanian, the mobile terminal 203 faces the SI acquisition failure when treating the second radio cell 202 as **the target cell for cell selection or cell reselection**. That is, the second radio cell 202 is **not the current serving cell** of the mobile terminal 203. Specifically, in the cell selection scenario, there is no current serving cell for the mobile terminal 203; in the cell reselection scenario, the second radio cell 202 is a neighboring cell of the current serving cell for the mobile terminal 203. Therefore, Subramanian does not disclose how the mobile terminal 203 deals with SI acquisition failure that takes place in the current serving cell. Subramanian also fails to disclose the mobile terminal 203 **re-acquires the SIB1 or the minimum SI from the current serving cell** when the SI acquisition failure occurs. Thus, Subramanian fails to disclose, teach or suggest, at least, "initiate, based on the indication, the SI message acquisition process in at least one of the SI windows to ***receive the SI message from the base station apparatus***; and initiate a re-

acquisition process to ***re-acquire the first type SIB from the base station apparatus*** upon the failure of the SI message acquisition process" where "***the base station apparatus"*** *is* ***"a current serving access node of the user equipment***," as recited in amended independent claim 1.

Further, neither Agiwal nor Subramanian discloses the feature, "the first type SIB comprising: ***a parameter associated with a condition for determination of a failure of an SI message acquisition process,***" as recited in amended independent claim 1.

For the reasons set forth above, Applicant respectfully submits that amended independent claim 1 is patentably distinguishable over Agiwal and Subramanian. As such, claim 2 depending from and further limiting independent claim 1 is, *a fortiori*, also patentably distinguishable over Agiwal and Subramanian, for at least the reasons discussed above, and also for the additional features contained in the dependent claim.

By the present Amendment and Response, Applicant has amended independent claims 3, 5 and 7 to include features similar to those in amended independent claim 1. For at least similar reasons presented above with regard to amended independent claim 1, Applicant respectfully submits that amended independent claims 3, 5 and 7 are also patentably distinguishable over Agiwal and Subramanian. As such, claims 4, 6 and 8 depending from claims 3, 5 and 7, respectively, are, *a fortiori*, also patentably distinguishable over Agiwal and Subramanian, for at least the reasons discussed above, and also for the additional features contained in each dependent claim. Withdrawal of the pending rejection is therefore respectfully requested.

C. Newly Added Claims 9-16

By the present Amendment and Response, Applicant has added claims 9-16. For at least similar reasons presented above with regard to amended independent claims 1, 3, 5 and

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7, claims 9-10, 11-12, 13-14 and 15-16 depending from claims 1, 3, 5 and 7, respectively, are, *a fortiori*, patentably distinguishable over Agiwal and Subramanian, for at least the reasons discussed above, and also for the additional features contained in each dependent claim.

D. Double Patenting

In the Office Action, the Examiner rejects claims 1-8 on the ground of nonstatutory double patenting as being unpatentable over claims 1-8 of U.S. Patent No.10,660,023 in view of Agiwal.

By the present Amendment and Response, Applicant has amended claims 1-7. Applicant respectfully submits that amended claims 1-8 are patentably distinct from claims 1-8 of U.S. Patent No. 10,660,023. Withdrawal of the nonstatutory double patenting rejection is therefore respectfully requested.

CONCLUSION

In view of the above, the undersigned representative respectfully submits that the foregoing Amendment and Response places this application in condition for allowance and a Notice to that effect is earnestly solicited. If the Examiner believes that there are any issues that can be resolved by a telephone conference, or that there are any informalities that can be corrected by an Examiner's amendment, please call the undersigned representative at the number given below.

The undersigned representative requests any extension of time that may be deemed necessary to further the prosecution of this application.

The undersigned representative authorizes the Commissioner to charge any additional fees under 37 C.F.R. 1.16 or 1.17 that may be required, or credit any overpayment, to Deposit Account No. 602615, referencing Attorney Docket No.: US83349.

Due to the Coronavirus (COVID-19) pandemic, if the undersigned representative cannot be reached by phone, Applicant respectfully requests the Examiner to email the undersigned representative using the email address provided below.

Respectfully submitted,

By / Alvin S. Koan, Reg.# 68468 /
Alvin S. Koan

Registration No.: 68,468
ScienBiziP, P.C.
550 S. Hope Street, Suite 2825
Los Angeles, CA 90071
Phone: (213) 426-1771
Fax: (213) 426-1788
Email: AlvinKoan@scienbizippc.com

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/408,922	05/10/2019	Atsushi ISHII	HWB-1035-1395

CONFIRMATION NO. 1156

145688
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

POA ACCEPTANCE LETTER

OC000000122017120

Date Mailed: 12/16/2020

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 12/11/2020.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/nbekele/

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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/408,922	05/10/2019	Atsushi ISHII	HWB-1035-1395

CONFIRMATION NO. 1156

126613
NIXON & VANDERHYE, P.C. / SLA
901 N. Glebe Road, 11th Floor
Arlington, VA 22203

POWER OF ATTORNEY NOTICE

OC000000122017083

Date Mailed: 12/16/2020

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 12/11/2020.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/nbekele/

UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

145688 7590 01/29/2021

SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

EXAMINER
VIANA DI PRISCO, GERMAN

ART UNIT	PAPER NUMBER
2642	

DATE MAILED: 01/29/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/408,922	05/10/2019	Atsushi ISHII	HWB-1035-1395	1156

TITLE OF INVENTION: APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	04/29/2021

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

145688 7590 01/29/2021
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/408,922	05/10/2019	Atsushi ISHII	HWB-1035-1395	1156

TITLE OF INVENTION: APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	04/29/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
VIANA DI PRISCO, GERMAN	2642	455-434000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1_____
2_____
3_____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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Ericsson Inc., Nokia v. Active Wireless Technologies
Page 405

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/408,922	05/10/2019	Atsushi ISHII	HWB-1035-1395	1156

145688 7590 01/29/2021

SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

EXAMINER	
VIANA DI PRISCO, GERMAN	
ART UNIT	PAPER NUMBER
2642	

DATE MAILED: 01/29/2021

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 02/11)

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/408,922	Applicant(s) ISHII, Atsushi	
	Examiner GERMAN VIANA DI PRISCO	Art Unit 2642	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to amendment filed o 12/14/2020.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-16 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☑ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/GERMAN VIANA DI PRISCO/
Primary Examiner, Art Unit 2642

Notice of References Cited	Application/Control No. 16/408,922	Applicant(s)/Patent Under Reexamination ISHII, Atsushi	
	Examiner GERMAN VIANA DI PRISCO	Art Unit 2642	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20180270738-A1	09-2018	MARTINEZ TARRADELL; Marta	H04W48/12	1/1
*	B	US-20200275477-A1	08-2020	SHAH; Rikin	H04W74/004	1/1
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	**Art Unit**
	GERMAN VIANA DI PRISCO	2642

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/07/2019	01/30/2020	09/01/2020	12/23/2020					
1	1	✓	✓	✓	=					
2	2	✓	✓	✓	=					
5	3	✓	✓	✓	=					
6	4	✓	✓	✓	=					
9	5	✓	✓	✓	=					
10	6	✓	✓	✓	=					
13	7	✓	✓	✓	=					
14	8	✓	✓	✓	=					
3	9				=					
4	10				=					
7	11				=					
8	12				=					
11	13				=					
12	14				=					
15	15				=					
16	16				=					

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	**Art Unit**
	GERMAN VIANA DI PRISCO	2642

CPC							
Symbol						**Type**	**Version**
H04W	/	48	/	10		F	2013-01-01
H04W	/	48	/	14		I	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	16	
/GERMAN VIANA DI PRISCO/ Primary Examiner, Art Unit 2642	23 December 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	14

U.S. Patent and Trademark Office — Part of Paper No.: 20201221

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	**Art Unit**
	GERMAN VIANA DI PRISCO	2642

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04W48/10	/	48	/	10

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	16	
/GERMAN VIANA DI PRISCO/ Primary Examiner, Art Unit 2642	23 December 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	14

U.S. Patent and Trademark Office — Part of Paper No.: 20201221

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	**Art Unit**
	GERMAN VIANA DI PRISCO	2642

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	4	10												
2	2	7	11												
5	3	8	12												
6	4	11	13												
9	5	12	14												
10	6	15	15												
13	7	16	16												
14	8														
3	9														

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 16	
/GERMAN VIANA DI PRISCO/ Primary Examiner, Art Unit 2642 (Primary Examiner)	23 December 2020 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 14

U.S. Patent and Trademark Office Part of Paper No.: 20201221

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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	Art Unit
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CPC - Searched*		
Symbol	Date	Examiner
H04W48/10, H04W48/14, H040/24, H04W74/002, H04W74/006 (text search)	08/07/2019	GV

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
EAST Image and keyword search in USPAT, US-PGPUB, DERWENT, EPO, JPO, and IBM_TDB (see attached search strategy)	08/07/2019	GV
Inventor name and Assignee search in PALM ExPO and EAST	08/07/2019	GV
EPO Database(http://ep.espacenet.com)	08/07/2019	GV
Updated search	01/30/2020	GV
Updated search	09/01/2020	GV
Updated search	12/23/2020	GV

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/408,922	ISHII, Atsushi
	Examiner	Art Unit
	GERMAN VIANA DI PRISCO	2642

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
See interference search in search history		12/23/2020	GV

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	440	sib1 with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/06 17:24
S2	133	sib1 with (includ$3 indicat$3) with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/06 17:24
S3	133	sib1 with (includ$3 indicat$3) with broadcast$3 with (si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 09:34
S4	47	S3 and (valid validity)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 09:34
S5	204	sib near3 valid	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 11:00
S6	2	S3 and S5	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 11:03
S7	1,306	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:16

S8	15	S7 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:17
S9	10	S7 and sib and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:18
S10	4,457	(sharp adj laboratories fg adj innovation)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:25
S11	42	S10 and sib and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 13:25
S12	39,197	(H04W48/10 H04W48/14 H040/24 H04W74/002 H04W74/006).cpc.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:09
S13	554	S12 and sib$1 and broadcast$3 and valid$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:09
S14	1,928	S12 and sib$1 and broadcast$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2019/08/07 15:11
S15	1,348	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/24 13:47

S16	28	S15 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/24 13:47
S17	6	S16 and valid.clm.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/24 14:46
S18	26	("20160174251" | "20170064764" | "20180310235" | "20190165984" | "20190223154" | "20190319764" | "20190349840" | "20190349841" | "20190349983" | "20190364601" "20160234736" "20180132168").PN.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 16:44
S19	15	("20150038142" "20170325049" "20160234736" "20170064764" "20180132168" "20170251500").PN.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 16:47
S20	4	"2017197063".did.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/29 16:48
S21	111	(fail$3) with broadcast$3 with sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 10:25
S22	268	(fail$3) with (acquir$3) with (si system adj information)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 10:39
S23	3	(fail$3) with (acquir$3) with (si system adj information) with (try$3 re$1try$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 10:42

S24	33	(fail$3) with (acquir$3) with (sib$1) with (si system adj information)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 11:24
S25	18,367	(acquir$3 acquisition) near4 (si system adj information)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 12:59
S26	243	(acquir$3 acquisition) near4 (si system adj information) with fail$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 12:59
S27	64	(acquir$3 acquisition) near4 (sib$1) with fail$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:06
S28	0	S27 and broadcast3 same3 failure	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:41
S29	0	S27 and broadcast3 same4 failure	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:41
S30	436	fail$3 with broadcast$3 with (si system adj information sib)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:44
S31	127	broadcast$3 with (si system adj information sib) near5 fail$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 13:48

S32	0	broadcast$3 with (si system adj information sib) near5 fail$3 with (different another) near4 (cell enodeb enb)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 14:14
S33	2	broadcast$3 with (si system adj information sib) near5 fail$3 same (different another) near4 (cell enodeb enb)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 14:15
S34	0	broadcast$3 with (si system adj information sib) near5 fail$3 with re$1select$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 14:16
S35	1,359	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 16:16
S36	30	S35 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/01/30 16:16
S37	1,412	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/29 17:27
S38	36	S37 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/29 17:27
S39	1	"16408922"	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/30 16:45

S40	38	(US-20190223145-$ or US-20180035342-$ or US-20190223082-$ or US-20180324682-$ or US-20180324679-$ or US-20180124685-$ or US-20150173054-$ or US-20110171929-$ or US-20180049107-$ or US-20190045379-$ or US-20180035468-$ or US-20190349841-$ or US-20190349844-$ or US-20180132168-$ or US-20170325049-$ or US-20170251500-$ or US-20170064764-$ or US-20160234736-$ or US-20150038142-$ or US-20190364601-$ or US-20190349983-$ or US-20190349840-$ or US-20190319764-$ or US-20190223154-$ or US-20190165984-$ or US-20180310235-$).did. or (US-20190387461-$ or US-20190387456-$ or US-20190297563-$ or US-20190239059-$ or US-20190349822-$ or US-20140315549-$ or US-20180049159-$ or US-20180007525-$ or US-20180317264-$ or US-20190297562-$ or US-20110275375-$).did. or (WO-2017197063-$).did.	US-PGPUB; FPRS	OR	ON	2020/08/30 17:02
S41	18	S40 and si near4 window	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/30 17:02
S43	51	(fail$3) with (receiv$3 obtain$3) with (minimum adj (si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 13:32
S44	0	(re$1try$3 try$3 adj again) with (minimum adj (si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 13:40
S45	14	(re$1try$3 try$3 adj again re$1acqui$5 re$1establish$4) with (minimum adj (si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 13:41

S46	7,638	(fail$3 rlf) with ((si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 13:46
S47	18	(fail$3 rlf) near3 (during) adj4((si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 13:47
S48	12,356	(window) with ((si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 14:01
S49	2,669	(window) near2 ((si system adj information))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 14:03
S50	984	S49 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 14:10
S51	522	si$1window	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 14:12
S52	41	(US-20190223145-$ or US-20180035342-$ or US-20190223082-$ or US-20180324682-$ or US-20180324679-$ or US-20180124685-$ or US-20150173054-$ or US-20110171929-$ or US-20180049107-$ or US-20190045379-$ or US-20180035468-$ or US-20190349841-$ or US-20190349844-$ or US-20180132168-$ or US-20170325049-$ or US-20170251500-$ or US-20170064764-$ or US-20160234736-$ or US-20150038142-$ or US-20190364601-$ or US-20190349983-$	US-PGPUB; FPRS	OR	ON	2020/08/31 14:12

		or US-20190349840-$ or US-20190319764-$ or US-20190223154-$ or US-20190165984-$ or US-20180310235-$).did. or (US-20190387461-$ or US-20190387456-$ or US-20190297563-$ or US-20190239059-$ or US-20190349822-$ or US-20140315549-$ or US-20180049159-$ or US-20180007525-$ or US-20180317264-$ or US-20190297562-$ or US-20110275375-$ or US-20180332521-$ or US-20200275522-$ or US-20200275477-$).did. or (WO-2017197063-$).did.				
S53	13	S51 and S52	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 14:12
S54	544	scheduling with si adj window	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/08/31 15:38
S55	1,414	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/09/01 10:49
S56	36	S55 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/09/01 10:49
S57	12	S55 and sib.clm.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/09/01 10:52
S58	76	(si sib) with acquisition with (fail$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/19 22:24

S59	32	S58 and mib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/19 23:26
S60	7	S58 and sib near3 version	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/19 23:27
S61	312	sib near3 version	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/19 23:28
S62	9	sib near3 version with (invalid "not valid")	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/19 23:28
S63	2	"20180270738".did.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/19 23:32
S64	27	(sib si) with fail$3 same (re$1try$3 re$1acquir$3)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 21:01
S65	309	(sib si) with fail$3 and (re$1try$3 re$1acquir$3 acquir$3) with (si sib mib)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 22:33
S66	130	(sib$1) with fail$3 and (re$1try$3 re$1acquir$3 acquir$3) with (mib minimum adj si sib1)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:08

S67	131	(sib$1) with fail$3 and (re$1try$3 re$1acquir$3 acquir$3) with (mib minimum adj2 (system adj information si) sib1)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:20
S68	88	(sib$1) with fail$3 and (re$1try$3 re$1acquir$3 acquir$3) near6 (mib minimum adj2 (system adj information si))	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:21
S69	9	t adj barred	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:45
S70	2	t adj barred with cell	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:46
S71	2	t adj barred with (base adj station enodeb enb nodeb cell)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:47
S72	5,802	(time timer) with barr$3 with (base adj station enodeb enb nodeb cell)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:47
S73	184	(time timer) with barr$3 with (base adj station enodeb enb nodeb cell) same expir$3	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:48
S74	11	(sib$1) with fail$3 and S73	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:48

S75	3	(time timer) with barr$3 with (base adj station enodeb enb nodeb cell) with expir$3 with (mib minimum adj si)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:54
S76	3	(time timer) with barr$3 with (base adj station enodeb enb nodeb cell) with expir$3 with (mib minimum)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:55
S77	4	(time timer) with barr$3 with (base adj station enodeb enb nodeb cell) with expir$3 same (mib minimum)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/20 23:55
S78	1,436	(ISHII near2 Atsushi).in.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/21 21:49
S79	44	S78 and sib	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/21 21:49
S80	1,606	sib1 with broadcast$3 with (system adj information si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/22 13:06
S82	118	S80 and (fail failure failing) with (receiv$3 acquir$3) with (system adj information si sib2 sib3 sib4 sib5 sib6 sib7 sib8 sib9)	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/22 13:08
S83	19	(fail failure failing) with (receiv$3 acquir$3) with broadcast$3 near4 sib$2	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/22 22:57

S84	2	"20180249505".did.	US-PGPUB; USPAT; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2020/12/23 13:10

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S86	31	(sib and fail$3 and broadcast$3).clm.	USPAT	OR	ON	2020/12/23 13:06

12/26/2020 6:29:21 PM
C:\Users\gvianadiprisco\Documents\EAST\Workspaces\16408922.wsp

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	16/408922
Filing Date	2019-05-10
First Named Inventor	Atsushi ISHII
Title	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
Art Unit	2642
Examiner Name	VIANA DI PRISCO, GERMAN
Attorney Docket Number	US83349

SIGNATURE of Applicant or Patent Practitioner

Signature	/Calvin H Chai/	Date (Optional)	2021-04-21
Name	Calvin H Chai	Registration Number	68009
Title (if Applicant is a juristic entity)	Patent Practitioner		
Applicant Name (if Applicant is a juristic entity)	SHARP KABUSHIKI KAISHA, FG INNOVATION COMPANY LIMITED		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 145688

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

SHARP KABUSHIKI KAISHA

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	/Mototaka Taneya/	Date (Optional)	
Name	Mototaka Taneya		
Title	MANAGING OFFICER BU PRESIDENT CORPORATE RESEARCH & DEVELOPMENT OF SHARP KABUSHIKI KAISHA		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 145688

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

FG INNOVATION COMPANY LIMITED

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	Chie Ming Chou	Date (Optional)	2019.2.21
Name	CHIE-MING CHOU		
Title	CEO of FG INNOVATION COMPANY LIMITED		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

(National Phase of PCT/JP2017/003319 filed on January 31, 2017)

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc Code: R46C.REQ
Document Description: Request under 37 CFR 1.46(c) to correct, update or change the applicant.

PTO/AIA/41 (04-15)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
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REQUEST TO CORRECT OR UPDATE THE NAME OF THE APPLICANT UNDER 37 CFR 1.46(c)(1), OR CHANGE THE APPLICANT UNDER 37 CFR 1.46(c)(2)

(FOR USE ONLY IN APPLICATIONS FILED ON OR AFTER SEPTEMBER 16, 2012)

Application Number	16/408922
Filing Date	2019-05-10
First Named Inventor	Atsushi ISHII
Art Unit	2642
Examiner Name	VIANA DI PRISCO, GERMAN
Practitioner Docket Number	US83349

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Applicant hereby **requests that the name of the applicant be corrected or updated under 37 CFR 1.46(c)(1), or that the applicant be changed under 37 CFR 1.46(c)(2),** in the above-identified application. **Requests under 37 CFR 1.46(c)(1) or (c)(2) cannot be submitted after payment of the issue fee or if the application has been patented.**

Please check the applicable box(es) below.

☐ 1. This request is to **correct or update the name of the applicant (under 37 CFR 1.46(c)(1))** and includes:

☐ An application data sheet (ADS) in accordance with 37 CFR 1.76(c) with the corrected or updated information shown with markings (*e.g.*, underlining for insertions, strikethrough for deletions). A Corrected Web-based ADS may be used.

Note: Requests under 37 CFR 1.46(c)(1) may be filed to correct typographical errors in the name of the § 1.46 applicant, or for updating the name of the § 1.46 applicant (*i.e.*, where there is no change in the applicant itself but just in the applicant's name). See the Manual of Patent Examining Procedure (MPEP) section 605.01.

■ 2. This request is to **change the applicant (under 37 CFR 1.46(c)(2))** and includes:

■ An application data sheet (ADS) in accordance with 37 CFR 1.76(c) that identifies the changes with proper markings (underlining for insertions and strikethrough for deletions). A Corrected Web-based ADS may be used.

■ A Statement Under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent). See MPEP 325.

I am the

☐ applicant* ■ attorney or agent of record Registration number 68,009 ☐ attorney or agent acting under 37 CFR 1.34 Registration number _____

Signature /Calvin H Chai/

Typed or printed name Calvin H Chai

Date April 21, 2021

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. *Juristic entities must be represented by a patent practitioner (See 37 CFR 1.31, applicable to any paper filed on or after September 16, 2012 that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below**.

☐ ** Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.46. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~SLA3814_1_6112-0174~~ US83349
	Application Number	16/408922
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Atsushi		SHII	

Residence Information (Select One) ● US Residency ○ Non US Residency ○ Active US Military Service

City	Vancouver	State/Province	WA	Country of Residence	US

Mailing Address of Inventor:

Address 1	3611 NW 18th Avenue
Address 2	

City	Vancouver	State/Province	WA
Postal Code	98665	Country	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	~~126613~~ 145688		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION		
Attorney Docket Number	~~SLA3814_1_6112-0174~~ US83349	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	23	Suggested Figure for Publication (if any)	

PTO/AIA/14 (02-18)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~SLA3814_1_6112-0174~~ US83349
	Application Number	16/408922
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	~~126613~~ 145688		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	PCT/US2019/031674	2019-05-10

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~SLA3014_1_6112-0174~~ US83349
	Application Number	16/408922
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
PCT/US2019/031674	Claims benefit of provisional	62669851	2018-05-10
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.			Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

			Remove
Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.			Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~SLA3814_1_6112-0174~~ US83349
	Application Number	16/408922
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~SLA3814_1_6112-0174~~ US83349
	Application Number	16/408922
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	~~SHARP Laboratories of America, Inc.~~ SHARP KABUSHIKI KAISHA		
Mailing Address Information For Applicant:			
Address 1	~~17200 SE Mill Plain Blvd., Suite 200~~ 1, TAKUMI-CHO, SAKAI-KU		
Address 2			
City	~~Vancouver~~ SAKAI CITY, OSAKA	**State/Province**	~~WA~~
Country	~~US~~ JP	Postal Code	~~98683~~ 90071
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~SLA3814_1_6112-0174~~ US83349
	Application Number	16/408922
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Applicant 2 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	FG Innovation Company Limited		
Mailing Address Information For Applicant:			
Address 1	Flat 2623, 26/F, Tuen Mun Central Square		
Address 2	22 Hoi Wing Road		
City	Tuen Mun, New Territories, Hong Ko	**State/Province**	
Country	CN	Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	~~SLA3814_1_6112-0174~~ US83349
	Application Number	16/408922
Title of Invention	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION	

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Calvin H Chai/			Date (YYYY-MM-DD)	2021-04-21
First Name	Calvin	Last Name	Chai	Registration Number	68009

Additional Signature may be generated within this form by selecting the Add button. Add

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	42518523
Application Number:	16408922
International Application Number:	
Confirmation Number:	1156
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Customer Number:	145688
Filer:	Calvin H Chai
Filer Authorized By:	
Attorney Docket Number:	US83349
Receipt Date:	21-APR-2021
Filing Date:	10-MAY-2019
Time Stamp:	21:40:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	US83349210421ASO.pdf	2033609 5eaa9bfbf6624a50cc5e72d7f3e2d983134df710	no	3

Warnings:

Information:					
2	Power of Attorney	US83349210421POA.pdf	3763309 08039d3a6f65a6218796474754ac65c3d3caee41	no	4
Warnings:					
Information:					
3	Transmittal Letter	US83349210421TSF.pdf	1464198 c77bf3f0e27ecdf051df5fc6028b4d81b2e5294b	no	2
Warnings:					
Information:					
4	Application Data Sheet	US83349210421ADS.pdf	5707955 4be4ae64d943419818c0e321dcccee8673129b66	no	8
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
			Total Files Size (in bytes):	12969071	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/96 (08-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: SHARP KABUSHIKI KAISHA, FG INNOVATION COMPANY LIMITED

Application No./Patent No.: 16/408922 Filed/Issue Date: 2019-05-10

Titled: APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION

SHARP KABUSHIKI KAISHA, a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☐ The assignee of the entire right, title, and interest.

2. ☑ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☑ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   FG INNOVATION COMPANY LIMITED

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: Atsushi ISHII To: SHARP LABORATORIES OF AMERICA, INC.

      The document was recorded in the United States Patent and Trademark Office at Reel 049501, Frame 0693, or for which a copy thereof is attached.

   2. From: SHARP LABORATORIES OF AMERICA, INC. To: SHARP KABUSHIKI KAISHA

      The document was recorded in the United States Patent and Trademark Office at Reel 050432, Frame 0398, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: SHARP KABUSHIKI KAISHA To: SHARP KABUSHIKI KAISHA, FG INNOVATION COMPANY LIMITED

The document was recorded in the United States Patent and Trademark Office at
Reel 055923, Frame 0844, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Calvin H Chai/	2021-04-21
Signature	Date
Calvin H Chai	68009
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PART B – FEE(S) TRANSMITTAL

Complete and send this form, together with the applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

By fax, send to: (571) 273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

145688 7590 01/29/2021
ScienBiziP, P.C.
550 S. Hope Street, Suite 2825
Los Angeles, CA 90071

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
16/408922	05/10/2019	ATSUSHI ISHII	HWB-1035-1395	1156

TITLE OF INVENTION:

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	Undiscounted	1200			1200	04/29/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363)

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1. ScienBiziP, P.C.
2.
3.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE	(B) RESIDENCE: (CITY and STATE or COUNTRY)
SHARP KABUSHIKI KAISHA	Sakai City, Osaka, JAPAN
FG Innovation Company Limited	Tuen Mun, HONG KONG

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☑ Corporation or other private group entity ☐ Government

4a. Fees Submitted: ☑ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment (*Please first reapply any previously paid fee shown above*):

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 50-5142

5. Change of Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29. NOTE: Absent a valid Certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27. NOTE: If the application was previously under micro entity status, checking this box will be taken as a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status. NOTE: Checking this box will be taken as a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Calvin H Chai/ Date 04/08/2021

Typed or printed name Calvin H Chai Registration No. 68009

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	16408922
Filing Date:	10-May-2019
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Filer:	Calvin H Chai
Attorney Docket Number:	US83349

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1200**

Electronic Acknowledgement Receipt

EFS ID:	42520174
Application Number:	16408922
International Application Number:	
Confirmation Number:	1156
Title of Invention:	APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION
First Named Inventor/Applicant Name:	Atsushi ISHII
Customer Number:	145688
Filer:	Calvin H Chai
Filer Authorized By:	
Attorney Docket Number:	US83349
Receipt Date:	22-APR-2021
Filing Date:	10-MAY-2019
Time Stamp:	09:44:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$1200
RAM confirmation Number	E20214L044293858
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	US8334920210408FIF.pdf	273521 b00846be14ad6839ae7a122a434b27fb9e35ec87	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30326 ebe8e04fb5ecbcbd9967dcc95f9ad92c1d4bee86	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	303847		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/408,922	05/10/2019	Atsushi ISHII	US83349

CONFIRMATION NO. 1156

145688
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

POA ACCEPTANCE LETTER

OC000000125101509

Date Mailed: 04/26/2021

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/21/2021.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sleutchit/

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/408,922	05/10/2019	2642	2340	US83349	8	4

CONFIRMATION NO. 1156

CORRECTED FILING RECEIPT

145688
SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

OC000000125101518

Date Mailed: 04/26/2021

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Atsushi ISHII, Vancouver, WA;

Applicant(s)

SHARP KABUSHIKI KAISHA, OSAKA, JAPAN;
FG Innovation Company Limited, Hong Kong, CHINA;

Power of Attorney: The patent practitioners associated with Customer Number 145688

Domestic Priority data as claimed by applicant

This application is a CON of PCT/US2019/031674 05/10/2019
which claims benefit of 62/669,851 05/10/2018

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 05/21/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/408,922**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No

Title

APPARATUS AND METHOD FOR ACQUISITION OF PERIODICALLY BROADCASTED SYSTEM INFORMATION IN WIRELESS COMMUNICATION

Preliminary Class

455

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

Sheet 1 of 1

INFORMATION DISCLOSURE CITATION	ATTY. DOCKET NO.	APPLICATION NO.
	181236US_1035-1395	16/408,922
	INVENTOR(S)	
	ISHII	
(Use several sheets if necessary)	FILING DATE	ART UNIT
	May 10, 2019	2642

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
		2019/0364601	11-2019	Kami			
		2019/0349983	11-2019	Loehr			
		2019/0349840	11-2019	Zhang			
		2019/0319764	10-2019	Nader			
		2019/0223154	7-2019	Jia			
		2019/0165984	5-2019	Shapin			
		2018/0310235	10-2018	You			
		2017/0064764	3-2017	Ke			
		2016/017425	~~6-2016~~ 01/2016	~~Zhang~~ Ruvolo ; et al.			
		2019/0349841	11-2019	Ishii			
		2016/0234736	8-2016	~~Qualcomm Incorporated~~ Kubota ; et al.			
		2018/0132168	5-2018	~~Samsung Electronics Co., Ltd.~~ Ingale ; et al.			

Change(s) applied to document,
/A.J./
2/22/2021

FOREIGN PATENT DOCUMENTS

		DOCUMENT	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO

OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)

		Notice of Allowance mailed January 13, 2020 in U.S. Patent Application 16/408,853
		International Search Report and Written Opinion mailed 9 August 2019 in PCT Application PCT/US2019/031669

*Examiner	/GERMAN VIANA DI PRISCO/	Date Considered	01/30/2020

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

)

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.V/

2980547

Sheet 1 of 1

INFORMATION DISCLOSURE CITATION	ATTY. DOCKET NO.	APPLICATION NO.
	SLA3814.1_6112-0174	16/408,922
	INVENTOR(S)	
	ISHII	
(Use several sheets if necessary)	FILING DATE	ART UNIT
	May 10, 2019	2642

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
		2017/0064764	3-2017	~~Qualcomm Incorporated~~ Ke ; et al.			
Change(s) applied to document, /A.J./ 2/22/2021		2017/0251500	8-2017	~~Samsung Electronics Co., Ltd.~~ Agiwal ; et al.			
		2015/0038142	2-2015	~~Broadcom Corporation~~ Wang ; et al.			
		2014/0086173	3-2014	~~Interdigital Patent Holdings, Inc.~~ Sadeghi ; et al.			
		2015/0215757	7-2015	Miskiewicz et al.			
		2017/0325049	11-2017	~~Panasonic Intellectual Property Corporation of America~~ Basu Mallick ; et al.			
		2010/0323714	12-2010	Schmidt et al.			

FOREIGN PATENT DOCUMENTS

		DOCUMENT	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
		WO 2017/197063 A1	11-2017	WIPO/PCT				

OTHER DOCUMENTS (including Author, Title, Date, Pertinent pages, etc.)

		International Search Report and Written Opinion mailed 23 July 2019 in PCT application PCT/US2019/031674

*Examiner	/GERMAN VIANA DI PRISCO/	Date Considered	08/07/2019

Examiner: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

)

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /G.V/

2939439

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/408,922	05/25/2021	11019557	US83349	1156

145688 7590 05/05/2021

SBPJ/ScienBiziP, P.C.
550 South Hope Street
Suite 2825
Los Angeles, CA 90071

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Atsushi ISHII, Vancouver, WA;
SHARP KABUSHIKI KAISHA, OSAKA, JAPAN;
FG Innovation Company Limited, Hong Kong, CHINA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Eastern District of Texas, Marshall Division on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
2:23-cv-00261	5/31/2023	for the Eastern District of Texas, Marshall Division

PLAINTIFF	DEFENDANT
ACTIVE WIRELESS TECHNOLOGIES LLC	T-MOBILE USA, INC. and T-MOBILE US, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	10,531,443	1/7/2020	Active Wireless Technologies LLC
2	11,019,557	3/25/2021	Active Wireless Technologies LLC
3	10,785,764	9/22/2020	Active Wireless Technologies LLC
4	10,601,566	3/24/2020	Active Wireless Technologies LLC
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**