

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
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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. 2:22-cv-000188		DATE FILED 06-01-2022	U.S. DISTRICT COURT for the Eastern District of Texas, Marshall Division
PLAINTIFF APEX BEAM TECHNOLOGIES LLC		DEFENDANT SAMSUNG ELECTRONICS CO., LTD. and SAMSUNG ELECTRONICS AMERICA, INC.	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1 10,462,767	10/29/2019	Apex Beam Technologies LLC	
2 10,568,113	2/18/2020	Apex Beam Technologies LLC	
3 10,912,081	2/2/2021	Apex Beam Technologies LLC	
4 10,944,527	3/9/2021	Apex Beam Technologies LLC	
5 10,951,271	3/16/2021	Apex Beam Technologies LLC	

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	
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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

AO 126 (Rev. 08/16)

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
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☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.);

DOCKET NO. 2:22-cv-00032	DATE FILED 02-01-2022	U.S. DISTRICT COURT for the Eastern District of Texas, Marshall Division
PLAINTIFF APEX BEAM TECHNOLOGIES LLC		DEPENDANT ONEPLUS TECHNOLOGY (SHENZHEN) CO., LTD.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 10,482,767	10/29/2019	Apex Beam Technologies LLC
2 10,568,113	2/18/2020	Apex Beam Technologies LLC
3 10,912,081	2/2/2021	Apex Beam Technologies LLC
4 10,944,527	3/9/2021	Apex Beam Technologies LLC
5 10,951,271	3/16/2021	Apex Beam Technologies LLC

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☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO. 2:22-cv-00031		DATE FILED 02/01/2022	U.S. DISTRICT COURT for the Eastern District of Texas, Marshall Division
PLAINTIFF APEX BEAM TECHNOLOGIES LLC		DEPENDANT ZTE CORPORATION	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1 10,482,767	10/29/2019		
2 10,568,113	2/18/2020		
3 10,912,081	2/2/2021		
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AMENDED

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☐ Trademarks or ☒ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO. 2:21-cv-00438	DATE FILED 11/30/2021	U.S. DISTRICT COURT for the Eastern District of Texas, Marshall Division
PLAINTIFF APEX BEAM TECHNOLOGIES LLC		DEFENDANT TCT Mobile International Limited, TCL Electronics Holdings Limited, TCL Technology Group Corporation, TCL Communication Limited, and TCL Communication Technology Holdings Limited
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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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
15/956,742	04/18/2018	Xiaobo ZHANG	ZL0205-0004-US

CONFIRMATION NO. 1787

POA ACCEPTANCE LETTER



OC000000129834371

155075
Zhong Law, LLC
100 Connell Drive
Suite 2300
Berkeley Heights, NJ 07922

Date Mailed: 11/18/2021

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/12/2021.

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.

/ylueng/



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
15/956,742	04/18/2018	Xiaobo ZHANG	S3876.10009US01

CONFIRMATION NO. 1787

POWER OF ATTORNEY NOTICE

97149
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098



OC000000129834334

Date Mailed: 11/18/2021

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/12/2021.

- The Power of Attorney to you in this application has been revoked by the assignee who has intervened as provided by 37 CFR 3.71. 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.

/ylueng/

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	15/956,742
Filing Date	04-18-2018
First Named Inventor	Xiaobo ZHANG
Title	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING
Art Unit	2471
Examiner Name	ELALLAM, AHMED
Attorney Docket Number	ZL0205-0004-US

SIGNATURE of Applicant or Patent Practitioner			
Signature	/Jialin Zhong/	Date (Optional)	
Name	Jialin Zhong	Registration Number	62937
Title (if Applicant is a juristic entity)	Registered Patent Attorney		
Applicant Name (if Applicant is a juristic entity)	APEX BEAM TECHNOLOGIES LLC		
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 <u>1</u> 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.

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:

155075

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):

APEX BEAM TECHNOLOGIES LLC

- ☐ 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	Deepak Sharma <i>Deepak Kumar Sharma</i>	Date (Optional)	11/10/2021
Name	Deepak Sharma		
Title	Managing Director		

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 1 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.

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.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: APEX BEAM TECHNOLOGIES LLC

Application No./Patent No.: 15/956,742 Filed/Issue Date: 04-18-2018

Titled: METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING

APEX BEAM TECHNOLOGIES LLC, a Limited Liability Company

(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:

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: XIAOBO ZHANG To: SHANGHAI LANGBO COMMUNICATION TECHNOLOGY COMPANY LIMITED

The document was recorded in the United States Patent and Trademark Office at
Reel 045581, Frame 0227, or for which a copy thereof is attached.

2. From: SHANGHAI LANGBO COMMUNICATION TECHNOLOGY COMPANY LIMITED To: APEX BEAM TECHNOLOGIES LLC

The document was recorded in the United States Patent and Trademark Office at
Reel 058068, Frame 0338, or for which a copy thereof is attached.

[Page 1 of 2]

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.

STATEMENT UNDER 37 CFR 3.73(c)

3. 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.

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.

/Jialin Zhong/

Signature

Jialin Zhong

Printed or Typed Name

November 11, 2021

Date

62,937

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.

Electronic Acknowledgement Receipt	
EFS ID:	44266790
Application Number:	15956742
International Application Number:	
Confirmation Number:	1787
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Customer Number:	97149
Filer:	Jialin Zhong/Eddie Rowell
Filer Authorized By:	Jialin Zhong
Attorney Docket Number:	S3876.10009US01
Receipt Date:	12-NOV-2021
Filing Date:	18-APR-2018
Time Stamp:	11:18:21
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	Application Data Sheet	ZL0205-0004-US_Marked_up_ADS.pdf	1725408 d9ebbd67fb8c5035a858115890d4a084e253fc92	no	8

Warnings:

Information:					
This is not an USPTO supplied ADS fillable form					
2	Power of Attorney	ZL0205-0004-US_82A.pdf	257266	no	1
			0c996e2158a4fb2c9eb0c32f07dcd89f97c6ad8f		
Warnings:					
Information:					
3	Power of Attorney	POA82B_Apex_ex.pdf	1100582	no	2
			d420eac9e65ed860fe977d519b96e062166a185		
Warnings:					
Information:					
4	Assignee showing of ownership per 37 CFR 3.73	ZL0205-0004-US_3_73c.pdf	121199	no	3
			f607669703011d917bacb05124556b062e82d4cb		
Warnings:					
Information:					
Total Files Size (in bytes):			3204455		
<p>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.</p> <p><u>New Applications Under 35 U.S.C. 111</u> 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.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> 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.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> 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.</p>					

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	126099-8010.US00
		Application Number	<u>15/956,742</u>
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		
<p>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.</p> <p>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.</p>			

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	
	Xiaobo		ZHANG		
Residence Information (Select One) US Residency • Non US Residency Active US Military Service					
City	Shanghai		Country of Residence ⁱ	CN	
Mailing Address of Inventor:					
Address 1	Room E3, 8th Floor, JunYao Building				
Address 2	No.789, ZhaoJiaBang Road, XuHui District				
City	Shanghai	State/Province			
Postal Code	200032	Country ⁱ	CN		
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	70416		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		
Attorney Docket Number	126099-8010.US00	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	6	Suggested Figure for Publication (if any)	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

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	70416		

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	<input type="text"/>	<input type="button" value="Remove"/>	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			<input type="button" value="Add"/>

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

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).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)	Remove
201710255811.X	CN	2017-04-19		

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

<p>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.</p> <p>☐ 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.</p>
--

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

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		<input type="button" value="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.			
		<input type="button" value="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:			
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>			
Name of the Deceased or Legally Incapacitated Inventor: <div style="border: 1px solid black; height: 20px; width: 100%;"></div>			
If the Applicant is an Organization check here. ☒			
Organization Name	Shanghai Langbo Communication Technology Company Limited <u>APEX BEAM TECHNOLOGIES LLC</u>		
Mailing Address Information For Applicant:			
Address 1	Room E3, 8th Floor, JunYao Building <u>104 EAST HOUSTON STREET</u>		
Address 2	No.700, Zhaodong Road, XuHui District <u>SUITE 180</u>		
City	Shanghai <u>MARSHALL</u>	State/Province	<u>TX</u>
Country	☒ US <u>US</u>	Postal Code	200052 <u>75670</u>
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button. <input type="button" value="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.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

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.



Organization Name

~~Shanghai Lengbo Communication Technology Company Limited~~

APEX BEAM TECHNOLOGIES LLC

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	Room E3, 8th Floor, JunYao Building			104 EAST HOUSTON STREET
Address 2	No.700, ZhongjiaDang Road, XuHui District			SUITE 180
City	Shanghai	MARSHALL	State/Province	TX
Country i	ON	US	Postal Code	200032 75670
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	Aaron Winger, Reg. No. 45,229 /Jialin Zhong/		Date (YYYY-MM-DD)	2018-04-19 2021-11-12
First Name	Aaron	Jialin	Last Name	Winger Zhong
Registration Number			45229 62937	

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

Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

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 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.



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.
15/956,742	10/29/2019	10462767	S3876.10009US01	1787

97149 7590 10/09/2019
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

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):

Xiaobo ZHANG, Shanghai, CHINA;
Shanghai Langbo Communication Technology Company Limited, Shanghai, 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.

IR 103 (Rev. 10/09)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of :	Xiaobo ZHANG	
Application No.:	15/956,742	Art Unit 2471
Filed:	April 18, 2018	
Conf. No.:	1787	
For:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING	
Examiner:	Ahmed Elallam	
Customer No.:	97149	
Attorney Docket No.:	S3876.10009US01	

COMMENTS ON STATEMENT OF REASONS FOR ALLOWANCE

Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Applicant acknowledges Examiner's statements of Reasons for Allowance of the above-referenced patent application and agrees that the claimed subject matter is patentable. However, Applicant takes no position regarding the Reasons for Allowance presented by the Examiner other than the positions Applicant may have previously taken during prosecution. Therefore, the Examiner's Reasons for Allowance should not be attributed to Applicant as an indication of the basis for Applicant's belief that the claims are patentable. Furthermore, Applicant respectfully asserts that there may also be additional reasons for patentability of the claimed subject matter not explicitly stated in this record and Applicant does not waive its rights to such arguments by not further addressing such reasons herein.

Dated this 23rd day of September, 2019.

Respectfully submitted,

/R. Burns Israelsen, Reg. No. 42685/
Registration No. 42685
Attorney for Applicant
Customer No. 97149
Telephone No. (435) 252-1360

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)

97149 7590 06/24/2019
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

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.
15/956,742	04/18/2018	Xiaobo ZHANG	S3876.10009US01	1787

TITLE OF INVENTION: METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	09/24/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
ELALLAM, AHMED	2471	370-329000

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 Maschoff Brennan

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)

SHANGHAI LANGBO COMMUNICATION TECHNOLOGY COMPANY LIMITED

SHANGHAI, CHINA

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. 50-5394

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 /R. Burns Israelsen, Reg. No. 42685/

Date September 23, 2019

Typed or printed name R. Burns Israelsen

Registration No. 42685

Electronic Patent Application Fee Transmittal				
Application Number:		15956742		
Filing Date:		18-Apr-2018		
Title of Invention:		METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		
First Named Inventor/Applicant Name:		Xiaobo ZHANG		
Filer:		Robert Burns Israelsen/Greta Schneider		
Attorney Docket Number:		S3876.10009US01		
Filed as Small 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	2501	1	500	500

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				500

Electronic Acknowledgement Receipt	
EFS ID:	37214173
Application Number:	15956742
International Application Number:	
Confirmation Number:	1787
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Customer Number:	97149
Filer:	Robert Burns Israelsen/Greta Schneider
Filer Authorized By:	Robert Burns Israelsen
Attorney Docket Number:	S3876.10009US01
Receipt Date:	23-SEP-2019
Filing Date:	18-APR-2018
Time Stamp:	20:09:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$ 500
RAM confirmation Number	E20199MK09310646
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	Miscellaneous Incoming Letter	S3876-10009US01_Examiner_Statement.pdf	120178	no	1
			f90930c5647c4f8b55b3b71cb40dfdd86d140041b		
Warnings:					
Information:					
2	Issue Fee Payment (PTO-85B)	S3876-10009US01_Issue_Fee_Transmittal.pdf	1384981	no	1
			cb84c8099292cccd426634e0e52a6b8b02676222		
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30636	no	2
			9f1b95f28a0f13ea5d618ce00cb674d235cc2787		
Warnings:					
Information:					
Total Files Size (in bytes):			1535795		
<p>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.</p> <p><u>New Applications Under 35 U.S.C. 111</u> 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.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> 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.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> 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.</p>					



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.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/956,742	04/18/2018	Xiaobo ZHANG	S3876.10009US01	1787
Maschoff Brennan 1389 Center Drive, Suite 300 Park City, UT 84098			EXAMINER ELALLAM, AHMED	
			ART UNIT 2471	PAPER NUMBER

DATE MAILED: 08/23/2019

PRIORITY ACKNOWLEDGMENT

- ☒ 1. Receipt is acknowledged of priority papers submitted under 35 U.S.C. 119. The papers have been placed of record in the file.
- ☐ 2. Applicant's claim for priority, based on papers filed in parent Application Number _____ submitted under 35 U.S.C. 119, is acknowledged.
- ☐ 3. The priority papers, submitted _____, after payment of the issue fee are
- ☐ acknowledged
- While the priority claim or certified copy filed will be placed in the file record, neither will be reviewed and the patent when published will not include the priority claim.
- See 37 CFR 1.55(a)(2).
- ☐ not acknowledged since the processing fee in 37 CFR 1.17(i) has not been received.
- ☐ 4. For utility and plant applications filed on or after November 29, 2000, the priority claim is not entered because the claim was not presented within the time limit required by 37 CFR 1.55(a)(1). A petition to accept a delayed claim for priority under 35 U.S.C. 119(a) - (d) or (f), or 365(a) may be filed. See 37 CFR 1.55(c) and MPEP 201.14(a).

Brunna D. FOR
571-272-4200 or 1-888-786-0101
Application Assistance Unit
Office of Data Management

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Xiaobo ZHANG	
Application No.:	15/956,742	Art Unit 2471
Filed:	April 18, 2018	
Conf. No.:	1787	
For:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING	
Examiner:	ELALLAM, AHMED	
Customer No.:	97149	
Attorney Docket No.:	S3876.10009US01	

**REQUEST TO ACKNOWLEDGE CERTIFIED COPY OF FOREIGN PRIORITY
DOCUMENTS**

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

Dear Sirs,

The above-referenced application was filed at the U.S. Patent & Trademark Office (USPTO) on April 18, 2018, with a priority claim to Chinese Application No. 201710255811.X, filed April 19, 2017. The details of the priority foreign application were provided in the Application Data Sheet (ADS) as required by 37 CFR 1.55(d)(1). The USPTO electronically retrieved the certified copy of the priority Chinese application, which appears on the Image File Wrapper on PAIR for this application, with the date of June 22, 2018.

The USPTO issued a Notice of Allowance on June 24, 2019, without an indication that the certified copy of the priority documents has been received by the USPTO. In view of the foregoing, and as readily apparent in the Image File Wrapper, the lack of acknowledgment of the certified

copy in the Notice of Allowance is a clear error. The Applicant respectfully requests issuance of a supplemental Notice of Allowability that acknowledges receipt of the certified copy of the priority documents that were received by the USPTO on June 22, 2018.

Dated this 9th day of August, 2019.

Respectfully submitted,

/R. Burns Israelsen, Reg. No. 42685/

R. Burns Israelsen
Registration No. 42685
Attorney for Applicant
Customer No. 97149
Telephone No. (435) 252-1360

Electronic Acknowledgement Receipt	
EFS ID:	36834740
Application Number:	15956742
International Application Number:	
Confirmation Number:	1787
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Customer Number:	97149
Filer:	Robert Burns Israelsen/Kaelee Cale
Filer Authorized By:	Robert Burns Israelsen
Attorney Docket Number:	S3876.10009US01
Receipt Date:	09-AUG-2019
Filing Date:	18-APR-2018
Time Stamp:	17:01:30
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	Miscellaneous Incoming Letter	S3876-10009US01_Ack_Foreign_Certified_Copy.pdf	124867 185e2cfa3da5917376033dc90385001eccd53a84	no	2

Warnings:

Information:	
Total Files Size (in bytes):	124867
<p>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.</p> <p><u>New Applications Under 35 U.S.C. 111</u> 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.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> 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.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> 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.</p>	



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

NOTICE OF ALLOWANCE AND FEE(S) DUE

97149 7590 06/24/2019
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

EXAMINER

ELALLAM, AHMED

ART UNIT PAPER NUMBER

2471

DATE MAILED: 06/24/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/956,742	04/18/2018	Xiaobo ZHANG	S3876.10009US01	1787

TITLE OF INVENTION: METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	09/24/2019

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.

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)

97149 7590 06/24/2019
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098

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.
15/956,742	04/18/2018	Xiaobo ZHANG	S3876.10009US01	1787

TITLE OF INVENTION: METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$500	\$0.00	\$0.00	\$500	09/24/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
ELALLAM, AHMED	2471	370-329000

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.

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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.

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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. _____



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.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/956,742	04/18/2018	Xiaobo ZHANG	S3876.10009US01	1787
97149	7590	06/24/2019	EXAMINER	
Maschoff Brennan 1389 Center Drive, Suite 300 Park City, UT 84098			ELALLAM, AHMED	
			ART UNIT	PAPER NUMBER
			2471	
DATE MAILED: 06/24/2019				

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.

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.
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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. 15/956,742	Applicant(s) ZHANG, Xiaobo	
	Examiner AHMED ELALLAM	Art Unit 2471	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 Application filed on 4/18/2018.
☐ 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 1-20. 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)	5. ☐ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date ____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material ____.	7. ☐ Other ____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date ____.	

/AHMED ELALLAM/ Primary Examiner, Art Unit 2471	
--	--

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance:

The prior art of record cited by the Examiner, fails to teach or suggest singly or in combination, the following:

Emphasis id added for the underlined limitations:

A method in a User Equipment (UE) for paging, comprising: monitoring a first signaling in X time intervals; and receiving a first radio signal; wherein X is a positive integer; the first signaling is used for determining scheduling information for the first radio signal; the scheduling information comprises at least one of: occupied time-frequency resource, adopted Modulation Coding Scheme (MCS), subcarrier spacing of subcarriers in occupied frequency domain resource ; the first radio signal carries a paging message; the frequency domain resource used for transmitting the first signaling belongs to a first subband; the first subband comprises a positive integer number of consecutive subcarriers in frequency domain; and at least one of: location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband is used for determining the X time intervals. As indicated in independent claim 1

Independent claims 6, 11 and 16 have similar limitation as in claim 1, and allowed for similar reasons.

Conclusion

3. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AHMED ELALLAM whose telephone number is (571)272-3097. The examiner can normally be reached on 9-5.

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, Chi Pham can be reached on 571-2723179. 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

Application/Control Number: 15/956,742
Art Unit: 2471

Page 4

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.

/AHMED ELALLAM/
Primary Examiner, Art Unit 2471
6/17/2019

<i>Notice of References Cited</i>	Application/Control No. 15/956,742	Applicant(s)/Patent Under Reexamination ZHANG, Xiaobo	
	Examiner AHMED ELALLAM	Art Unit 2471	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-20190109695-A1	04-2019	KIM; Eunsun	H04L5/00	1/1
*	B	US-20180097678-A1	04-2018	ZHOU; Huayu	H04L5/0005	1/1
*	C	US-20180070341-A1	03-2018	ISLAM; TOUFIQUL	H04L1/1887	1/1
*	D	US-20180054800-A1	02-2018	Yeo; Jeongho	H04L5/0042	1/1
*	E	US-20170279579-A1	09-2017	Qian; Chen	H04B7/0452	1/1
*	F	US-10271295-B2	04-2019	Tsai; Allan Y.	H04B7/0617	1/1
*	G	US-10159097-B2	12-2018	Ji; Tingfang	H04L45/00	1/1
*	H	US-10135663-B2	11-2018	Qu; Daiming	H04L27/34	1/1
	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.

U.S. Patent and Trademark Office
PTO-892 (Rev. 01-2001)

Notice of References Cited

Part of Paper No. 20190617

Search Notes 	Application/Control No. 15/956,742	Applicant(s)/Patent Under Reexamination ZHANG, Xiaobo
	Examiner AHMED ELALLAM	Art Unit 2471

CPC - Searched*		
Symbol	Date	Examiner
H04L1/1812 OR H04L25/00 OR H04L5/0053 OR H04W36/0088 OR H04W68/005 OR H04W68/02 OR H04W72/042	06/13/2019	AE
H04L27/2666 OR H04W72/1289	06/17/2019	AE

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
BRS(EAST)	06/13/2019	AE
	06/17/2019	AE
H04L1/1812 OR H04L25/00 OR H04L5/0053 OR H04W36/0088 OR H04W68/005 OR H04W68/02 OR H04W72/042	06/13/2019	AE
H04L27/2666 OR H04W72/1289	06/17/2019	AE

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
H04W	68/02 68/005 72/042 72/1289	06/13/2019	AE
H04L	5/0053 1/1812 27/2666 27/0012	06/17/2019	AE

/AHMED ELALLAM/ Primary Examiner, Art Unit 2471	
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Issue Classification 	Application/Control No. 15/956,742	Applicant(s)/Patent Under Reexamination ZHANG, Xiaobo	
	Examiner AHMED ELALLAM	Art Unit 2471	

CPC						
Symbol					Type	Version
H04W	/	68	/	02	F	2013-01-01
H04L	/	5	/	0053	I	2013-01-01
H04W	/	36	/	0088	I	2013-01-01
H04L	/	1	/	1812	I	2013-01-01
H04W	/	72	/	042	I	2013-01-01
H04L	/	25	/	00	I	2013-01-01
H04W	/	68	/	005	I	2013-01-01

CPC Combination Sets						
Symbol			Type	Set	Ranking	Version

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/AHMED ELALLAM/ Primary Examiner, Art Unit 2471	17 June 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	7

U.S. Patent and Trademark Office

Part of Paper No.: 20190617

Issue Classification 	Application/Control No. 15/956,742	Applicant(s)/Patent Under Reexamination ZHANG, Xiaobo
	Examiner AHMED ELALLAM	Art Unit 2471

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H04W	/	68	/ 02
H04W	/	72	/ 04
H04L	/	5	/ 00
NON-CLAIMED			
	/		/

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/AHMED ELALLAM/ Primary Examiner, Art Unit 2471	17 June 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	7

U.S. Patent and Trademark Office

Part of Paper No.: 20190617

Issue Classification 	Application/Control No. 15/956,742	Applicant(s)/Patent Under Reexamination ZHANG, Xiaobo
	Examiner AHMED ELALLAM	Art Unit 2471

☒ 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		10		19										
	2		11		20										
	3		12												
	4		13												
	5		14												
	6		15												
	7		16												
	8		17												
	9		18												

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 20	
/AHMED ELALLAM/ Primary Examiner, Art Unit 2471 (Primary Examiner) _____ (Date) _____		O.G. Print Claim(s) 1	O.G. Print Figure 7

U.S. Patent and Trademark Office

Part of Paper No.: 20190617

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S8	38	((("ZHANG") near3 ("Xiaobo"))).INV. and shanghai.as.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/06/13 12:42
S9	36	((("ZHANG") near3 ("Xiaobo"))).INV. and shanghai.as.	US-PGPUB; USPAT	OR	OFF	2019/06/13 12:42
S10	74	(paging page) same numerolog\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	OFF	2019/06/13 14:24
S11	148	(paging page) same numerolog\$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 14:25
S12	6	S11 and sub\$1band same sub\$1carrier adj2 spacing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 14:25
S13	19	S11 and sub\$1band and sub\$1carrier adj2 spacing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 14:28
S14	19	S13 and symbol	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 14:29
S15	15	S14 and frame and time near3 (interval period duration)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2019/06/13 14:30

			DERWENT			
S16	10	S15 and dci	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 14:31
S19	2	(5G new adj radio numerolog\$4) and sub\$1band same sub\$1carrier adj2 spacing and IMSI same ("1024" "4096" "16384" C-RNTI)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 18:38
S22	3085	(5G new adj radio numerolog\$4) and sub\$1band same consecutive sub\$1carrier and sub\$1carrier adj2 spacing and MCS	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 18:43
S24	1440	monitor\$5 same (\$1DCCH DCI DSCCH page paging signal signal\$1ing schedul\$5 (physical adj layer adj signaling DCI PDCCH NR-PDCCH PDCCH with (Common adj Search adj Space CSS UE-Specific adj Search adj Space USS)) (PDCCH same CRC same scrambl\$4 same (Paging adj Radio adj Network adj Temporary adj (Identity id identifier) P-RNTI))) same (L M N X Y Z) SAME (time interval interval duration) SAME integer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 18:58
S25	10	S22 and S24	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 18:58
S28	38530	(H04L1/1812 OR H04L25/00 OR H04L5/0053 OR H04W36/0088 OR H04W68/005 OR H04W68/02 OR H04W72/042).CPC.	US-PGPUB; USPAT	OR	OFF	2019/06/13 19:28
S29	996	S28 and S22	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 19:29
S30	1	S29 and (monitor\$5 and (\$1DCCH DCI DSCCH page paging signal signal\$1ing schedul\$5 (physical adj layer adj signaling DCI PDCCH NR-PDCCH PDCCH with (Common adj Search adj Space CSS UE-Specific adj Search adj Space USS)) (PDCCH same CRC same scrambl\$4 (Paging adj Radio adj Network adj Temporary adj (Identity id identifier) P-RNTI))) same (L M N X Y Z) SAME (time	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 19:29

		interval interval duration) SAME integer).clm.				
S31	106	S29 and (monitor\$5 and (\$1DCCH DCI DSOCH page paging signal signal\$1ing schedul\$5 physical adj layer adj signaling DCI PDCCH NR-PDCCH PDCCH Common adj Search adj Space CSS UE-Specific adj Search adj Space USS CRC scrambl\$4 Paging adj Radio adj Network adj Temporary adj (Identity id identifier)) P-RNTI) .clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 19:31
S32	2	S31 and ((L M N X Y Z) and (time interval interval duration window) and integer) .clm.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/13 19:32
S34	3104	(5G new adj radio numerolog\$4) and sub\$1band same consecutive sub\$1carrier and sub\$1carrier adj2 spacing and MCS	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/17 10:27
S35	1	S34 and (location position) same first adj3 subband and subcarrier adj3 spacing same first adj2 subband same ((L M N X Y Z) same (time adj3 interval interval duration window) and integer)	US-PGPUB; USPAT	OR	OFF	2019/06/17 10:27
S36	1	S34 and ((location position) same first adj3 subband subcarrier adj3 spacing same first adj2 subband) same ((L M N X Y Z) same (time adj3 interval interval duration window))	US-PGPUB; USPAT	OR	OFF	2019/06/17 10:27
S37	2	S34 and ((location position) same subband subcarrier adj3 spacing same first adj2 subband) same ((L M N X Y Z) same (time adj3 interval interval duration window))	US-PGPUB; USPAT	OR	OFF	2019/06/17 10:28
S38	4	S34 and ((location position subcarrier adj3 spacing) same subband) same ((L M N X Y Z integer) same (time adj3 interval interval duration window))	US-PGPUB; USPAT	OR	OFF	2019/06/17 10:29
S39	2	S34 and (((location position subcarrier adj3 spacing) and subband) and ((L M N X Y Z integer) and (time adj3 interval interval duration window))) .clm.	US-PGPUB; USPAT	OR	OFF	2019/06/17 10:36
S40	170	(5G new adj radio numerolog\$4) and sub\$1band same sub\$1carrier adj2 spacing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT	OR	ON	2019/06/17 10:37
S41	2	S40 and (((location position subcarrier adj3 spacing) and subband) and ((L M N X Y Z integer) and (time adj3 interval interval duration window))) .clm.	US-PGPUB; USPAT	OR	OFF	2019/06/17 10:37
S42	1	"20180097678".pn.	US-	OR	OFF	2019/06/17

EAST Search History

			PGPUB; USPAT			11:03
S43	4391	(H04L27/2666 OR H04W72/1289).CPC.	US- PGPUB; USPAT	OR	OFF	2019/06/17 11:07
S44	3	S43 and (((location position subcarrier adj3 spacing) and subband) and ((L M N X Y Z integer) and (time adj3 interval interval duration window))).clm.	US- PGPUB; USPAT	OR	OFF	2019/06/17 11:08
S46	1065	H04L27/0012.CPC.	US- PGPUB; USPAT	OR	OFF	2019/06/17 12:24
S47	0	S46 and (((location position subcarrier adj3 spacing) and subband) and ((L M N X Y Z integer) and (time adj3 interval interval duration window))).clm.	US- PGPUB; USPAT	OR	OFF	2019/06/17 12:24

6/ 17/ 2019 1:46:37 PM

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/956,742	04/18/2018	Xiaobo ZHANG	S3876.10009US01

CONFIRMATION NO. 1787

POA ACCEPTANCE LETTER

97149
Maschoff Brennan
1389 Center Drive, Suite 300
Park City, UT 84098



Date Mailed: 02/05/2019

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/31/2019.

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/

**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 or equivalent) to identify the application to which the Power of Attorney directed, in accordance with 37 CFR 1.5. If the Power of Attorney by Applicant form is not accompanied by this transmittal form or an equivalent, the Power of Attorney will not be recognized in the application.

Application Number	15/956,742		
Filing Date	April 18, 2018		
First Named Inventor	Xiaobo Zhang		
Title	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		
Art Unit	2415		
Examiner Name	Jeffrey M. Rutkowski		
Attorney Docket Number	S3876.10009US01		
SIGNATURE of Applicant or Patent Practitioner			
Signature	/R. Burns Israelsen/	Date	January 31, 2019
Name	R. Burns Israelsen	Telephone	(435) 252-1360
Registration Number	42685		

MASCHOFF BRENNAN, PLLC
1389 Center Drive, SUITE 300
PARK CITY, UTAH 84098, USA

POWER OF ATTORNEY BY APPLICANT

[Assignee, Legal Representative or Person with Proprietary Interest]

I hereby revoke all previous powers of attorney given in the application identified in the attached Transmittal for Power of Attorney form.

- I hereby appoint 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:

97149

Please recognize or change the correspondence address for the above-identified patent to:

- The address associated with the above-mentioned Customer Number.

I am the Applicant:

- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign
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SIGNATURE of Applicant for Patent

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

Signature	Xiaobo ZHANG	Date	January 23, 2019
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Company	SHANGHAI LANGBO COMMUNICATION TECHNOLOGY COMPANY LIMITED	Title	CTO

NOTE: Signature - This form must be signed by the applicant or applicant's representative in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms for more than one signature, see below*.

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证 明

本证明之附件是向本局提交的下列专利申请文件副本。

申 请 号：201710255811.X

申 请 类 型：发明专利

发 明 创 造 名 称：一种被用于寻呼的用户设备、基站中的方法和装置

申 请 日：2017 年 04 月 19 日

申 请 人：上海朗帛通信技术有限公司

发明人或设计人：张晓博

局长

申长雨

2018 年 06 月 11 日

权 利 要 求 书

1. 一种用于寻呼的用户设备中的方法，其中，包括如下步骤：

- 步骤 A. 在 X 个时间间隔中分别监测第一信令；
- 步骤 B. 接收第一无线信号。

其中，所述 X 是正整数，所述第一信令被用于确定所述第一无线信号的调度信息，所述调度信息包括{所占用的时频资源，所采用的 MCS，所占用的频域资源中的子载波的子载波间隔}中至少之一，所述第一无线信号携带寻呼消息。传输所述第一信令所使用的频域资源属于第一子频带，所述第一子频带在频域包括正整数个连续的子载波，{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波的子载波间隔}中至少之一被用于确定所述 X 个时间间隔。

2. 根据权利要求 1 所述的方法，其特征在于，所述 X 个时间间隔中的任意一个时间间隔在时域都属于第一时间窗，所述第一时间窗的时间长度是预定义的，所述第一时间窗被分成 Y 个时间间隔，所述 X 个时间间隔是所述 Y 个时间间隔中的 X 个，所述 Y 是不小于 X 的正整数，所述所述第一子频带中所包括的子载波的子载波间隔被用于确定所述 Y，所述第一信令的监测者的特征 ID 被用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

3. 根据权利要求 2 所述的方法，其特征在于，所述第一时间窗属于 Z 个时间窗中之一，所述 Z 是大于 1 的整数。所述 Z 是预定义的；或者所述 Z 是可配置的。所述 Z 个时间窗中的任意两个时间窗的时间长度是相等的，所述所述第一信令的监测者的特征 ID 被用于在所述 Z 个时间窗中确定所述第一时间窗。

4. 根据权利要求 1, 2, 3 中任一项所述的方法，其特征在于，所述步骤 A 还包括如下步骤：

- 步骤 A0. 接收第二无线信号。

其中，所述第二无线信号被用于确定{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波的子载波间隔}中至少之一。

5. 根据权利要求 1-4 中任一项所述的方法，其特征在于，所述步骤 A 还包括如下步骤：

- 步骤 A1. 接收第二信令。

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其中，所述第二信令被用于确定 Q 个子频带，所述第一子频带属于所述 Q 个子频带中之一，所述 Q 个子频带中的任意一个子频带包括正整数个连续的子载波，所述所述第一信令的监测者的特征 ID 被用于在所述 Q 个子频带中确定所述第一子频带，所述 Q 是正整数。

6. 一种用于寻呼的基站中的方法，其中，包括如下步骤：

– 步骤 A. 在 X 个时间间隔中的正整数个时间间隔中分别发送第一信令；

– 步骤 B. 发送第一无线信号。

其中，所述 X 是正整数，所述第一信令被用于确定所述第一无线信号的调度信息，所述调度信息包括{所占用的时频资源，所采用的 MCS，所占用的频域资源中的子载波的子载波间隔}中至少之一，所述第一无线信号携带寻呼消息。传输所述第一信令所使用的频域资源属于第一子频带，所述第一子频带在频域包括正整数个连续的子载波，{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波的子载波间隔}中至少之一被用于确定所述 X 个时间间隔。

7. 根据权利要求 6 所述的方法，其特征在于，所述 X 个时间间隔中的任意一个时间间隔在时域都属于第一时间窗，所述第一时间窗的时间长度是预定义的，所述第一时间窗被分成 Y 个时间间隔，所述 X 个时间间隔是所述 Y 个时间间隔中的 X 个，所述 Y 是不小于 X 的正整数，所述所述第一子频带中所包括的子载波的子载波间隔被用于确定所述 Y ，所述第一信令的监测者的特征 ID 被用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

8. 根据权利要求 7 所述的方法，其特征在于，所述第一时间窗属于 Z 个时间窗中之一，所述 Z 是大于 1 的整数。所述 Z 是预定义的；或者所述 Z 是可配置的。所述 Z 个时间窗中的任意两个时间窗的时间长度是相等的，所述所述第一信令的监测者的特征 ID 被用于在所述 Z 个时间窗中确定所述第一时间窗。

9. 根据权利要求 6，7，8 中任一项所述的方法，其特征在于，所述步骤 A 还包括如下步骤：

– 步骤 A0. 发送第二无线信号。

其中，所述第二无线信号被用于确定{所述所述第一子频带在频域

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的位置, 所述所述第一子频带中所包括的子载波的子载波间隔} 中至少之一。

10. 根据权利要求 6-9 中任一项所述的方法, 其特征在于, 所述步骤 A 还包括如下步骤:

- 步骤 A1. 发送第二信令。

其中, 所述第二信令被用于确定 Q 个子频带, 所述第一子频带属于所述 Q 个子频带中之一, 所述 Q 个子频带中的任意一个子频带包括正整数个连续的子载波, 所述所述第一信令的监测者的特征 ID 被用于在所述 Q 个子频带中确定所述第一子频带, 所述 Q 是正整数。

11. 一种用于寻呼的用户设备, 其中, 包括如下模块:

- 第一接收模块: 用于在 X 个时间间隔中分别监测第一信令;

- 第二接收模块: 用于接收第一无线信号。

其中, 所述 X 是正整数, 所述第一信令被用于确定所述第一无线信号的调度信息, 所述调度信息包括{所占用的时频资源, 所采用的 MCS, 所占用的频域资源中的子载波的子载波间隔} 中至少之一, 所述第一无线信号携带寻呼消息。传输所述第一信令所使用的频域资源属于第一子频带, 所述第一子频带在频域包括正整数个连续的子载波, {所述第一子频带在频域的位置, 所述第一子频带中所包括的子载波的子载波间隔} 中至少之一被用于确定所述 X 个时间间隔。

12. 一种用于寻呼的基站设备, 其中, 包括如下模块:

- 第一发送模块: 用于在 X 个时间间隔中的正整数个时间间隔中分别发送第一信令;

- 第二发送模块: 用于发送第一无线信号。

其中, 所述 X 是正整数, 所述第一信令被用于确定所述第一无线信号的调度信息, 所述调度信息包括{所占用的时频资源, 所采用的 MCS, 所占用的频域资源中的子载波的子载波间隔} 中至少之一, 所述第一无线信号携带寻呼消息。传输所述第一信令所使用的频域资源属于第一子频带, 所述第一子频带在频域包括正整数个连续的子载波, {所述第一子频带在频域的位置, 所述第一子频带中所包括的子载波的子载波间隔} 中至少之一被用于确定所述 X 个时间间隔。

说明书

一种被用于寻呼的用户设备、基站中的方法和装置

技术领域

本发明涉及无线通信系统中的传输方案，特别是涉及支持多种数理结构（Numerology）的通信系统中的寻呼传输的方法和装置。

背景技术

未来无线通信系统的应用场景越来越多元化，不同的应用场景对系统提出了不同的性能要求。为了满足多种应用场景的不同的性能需求，在 3GPP（3rd Generation Partner Project，第三代合作伙伴项目）RAN（Radio Access Network，无线接入网）#72 次全会上决定对新空口技术（NR，New Radio）进行研究。在 3GPP RAN #75 次全会上通过了 5G 新空口技术（NR）的工作项目（WI，Working Item）的立项，开始对 5G 新空口技术进行标准化。

为了能够灵活适应多种不同的应用场景，未来的无线通信系统，特别是 5G NR 将可以支持多种数理结构（Numerology），多种数理结构是指多种子载波间隔，多种符号时间长度，多种 CP（Cyclic Prefix，循环前缀）长度等。为了能够简化系统的设计与用户设备实现的复杂度，针对不同的数理结构，整个系统物理层设计最好能够采用一种统一结构。

发明内容

在现有 LTE 系统中，寻呼的传输时机统一通过 PF（Paging Frame，寻呼帧）和 PO（Paging Occasion，寻呼机会）来定义，其中 PF 为有可能传输寻呼消息的无线帧，而 PO 用来确定在 PF 的帧中有可能传输寻呼消息的子帧。LTE 中的无线帧的时间长度为固定的 10 毫秒，子帧的时间长度为固定的 1 毫秒。由于一个 LTE 网络一般采用单一的数理结构（Numerology）或者数理结构在一个网络中基本长时间不变，采用固定时长的 PF 和 PO 来定义寻呼的可能时间可以在保证寻呼容量和不增加用户设备（UE，User Equipment）功率消耗的前提下，简化系统设计。在 5G NR 下，由于支持不同的数理结构，在一个给定的时长内，比如 1 毫

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秒，可能包含了多个基本的调度单元（比如时隙，Slot），如果沿用现有的寻呼时机的设计，在这个 1 毫秒内用户设备针对不同的数理结构要对寻呼消息进行不同次数的检测，因而导致在某些数理结构下的功率消耗的大大增加。同时也会导致寻呼容量因为不同的数理结构的采用而相差巨大。

为了解决上述在 5G NR 中当采用多种数理结构（Numerology）时的寻呼的设计问题，本发明提供了解决方案。该方案依据寻呼所采用的数理结构来确定寻呼的传输时机，从而保证在不同的数理结构下用户设备监测寻呼消息的复杂度和功耗相差不大，同时寻呼的容量也保持基本不变。需要说明的是，在不冲突的情况下，本申请的 UE（User Equipment，用户设备）中的实施例和实施例中的特征可以应用到基站中，反之亦然。进一步的，在不冲突的情况下，本申请的实施例和实施例中的特征可以任意相互组合。

本发明公开了一种用于寻呼的用户设备中的方法，其中，包括如下步骤：

- 步骤 A. 在 X 个时间间隔中分别监测第一信令；
- 步骤 B. 接收第一无线信号。

其中，所述 X 是正整数，所述第一信令被用于确定所述第一无线信号的调度信息，所述调度信息包括{所占用的时频资源，所采用的 MCS，所占用的频域资源中的子载波的子载波间隔}中至少之一，所述第一无线信号携带寻呼消息。传输所述第一信令所使用的频域资源属于第一子频带，所述第一子频带在频域包括正整数个连续的子载波，{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波的子载波间隔}中至少之一被用于确定所述 X 个时间间隔。

作为一个实施例，采用所述方法，所述用于设备可以依据传输寻呼所采用的子载波间隔来确定监测传输寻呼的时间间隔，节省功耗。

作为一个实施例，所述方法设计了基于不同的子载波间隔的一致的寻呼时机的计算方式，同时当采用不同的子载波间隔传输寻呼消息时，保持寻呼容量不变。

作为一个实施例，所述寻呼消息包括被寻呼的用户设备的特征 ID。

作为一个实施例，在所述 X 个时间间隔中的每一个时间间隔中针对

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所述第一信令最多执行 P 次检测，所述 P 是正整数。

作为一个实施例，所述 X 个时间间隔中的任意两个时间间隔的时间长度相等。

作为一个实施例，所述 X 个时间间隔中存在两个时间间隔的时间长度不等。

作为一个实施例，所述 X 个时间间隔中的任意一个时间间隔为一个时隙 (Slot)。

作为一个实施例，所述 X 个时间间隔中的任意两个时间间隔的时间长度相等，所述 X 个时间间隔中的每个时间间隔的时间长度和所述第一频带中所包括的子载波的子载波间隔有关。

作为一个实施例，所述 X 个时间间隔中的任意一个时间间隔为 M 个 OFDM (Orthogonal Frequency Division Multiplexing, 正交频分复用) 符号，所述 M 为小于 14 的正整数。

作为一个实施例，所述 X 个时间间隔中的任意一个时间间隔为 M 个 OFDM (Orthogonal Frequency Division Multiplexing, 正交频分复用) 符号，所述 M 为小于 7 的正整数。

作为一个实施例，所述 X 个时间间隔中的任意两个时间间隔在时域正交，所述正交是指不存在一个时间单元同时属于所述 X 个时间间隔中的任意两个时间间隔。

作为一个实施例，所述 X 个时间间隔中存在两个时间间隔在时域是离散的。

作为一个实施例，所述第一信令是物理层信令。

作为一个实施例，所述第一信令是 DCI (Downlink Control Information, 下行控制信息)。

作为一个实施例，所述第一信令通过 PDCCH (Physical Downlink Control Channel, 物理下行控制信道) 传输。

作为一个实施例，所述第一信令通过 NR-PDCCH (New Radio Physical Downlink Control Channel, 新空口物理下行控制信道) 传输。

作为一个实施例，所述第一信令通过 PDCCH (Physical Downlink Control Channel, 物理下行控制信道) 传输，所述 PDCCH 在 CSS (Common Search Space, 公共搜索空间) 中传输。

说明书

作为一个实施例，所述第一信令通过 PDCCH (Physical Downlink Control Channel, 物理下行控制信道) 传输，所述 PDCCH 在 USS (UE-Specific Search Space, UE 特定搜索空间) 中传输。

作为一个实施例，所述第一信令通过 PDCCH (Physical Downlink Control Channel, 物理下行控制信道) 传输，所述 PDCCH 的 CRC (Cyclic Redundancy Check, 循环冗余校验) 经过 P-RNTI (Paging Radio Network Temporary Identity, 寻呼无线网络临时标识) 加扰。

作为一个实施例，所述 MCS (Modulation Coding Scheme, 调制编码方式) 包括的调制方式为 {QPSK, 16QAM, 64QAM, 256QAM, 1024QAM} 中之一。

作为一个实施例，所述子载波间隔等于 15kHz 乘以 2 的 K 次幂，所述 K 为整数。

作为一个实施例，所述第一子频带 (Subband) 包括 12 的正整数倍个子载波。

作为一个实施例，所述第一子频带中包括的所有子载波的子载波间隔都相等。

作为一个实施例，所述所述第一子频带在频域的位置是指所述第一子频带在所处的载波 (Carrier) 中的位置。

作为一个实施例，所述所述第一子频带在频域的位置是指所述第一子频带在所处的载波 (Carrier) 在频域的位置。

作为一个实施例，所述所述第一子频带在频域的位置是指所述第一子频带在所处的载波 (Carrier) 中的子频带索引。

作为一个实施例，所述所述第一子频带在频域的位置是指所述第一子频带在所处的频带 (Band) 所对应的频率资源中的位置。

作为一个实施例，{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波的子载波间隔} 中至少之一被所述用户设备用于确定所述 X 个时间间隔。

作为一个实施例，{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波的子载波间隔} 中至少之一被所述用户设备基于给定映射规则确定所述 X 个时间间隔。

作为一个实施例，所述第一无线信号通过 DL-SCH (Downlink Shared

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Channel, 下行共享信道) 传输。

作为一个实施例, 所述第一无线信号通过 PDSCH (Physical Downlink Shared Channel, 物理下行共享信道) 传输。

作为一个实施例, 第一比特块依次经过调制映射器 (Modulation Mapper), 层映射器 (Layer Mapper), 预编码 (Precoding), 资源粒子映射器 (Resource Element Mapper), OFDM 信号发生 (Generation) 之后得到所述第一无线信号。所述第一比特块包括一个码块经过信道编码之后的输出。作为一个子实施例, 所述码块是 TB (Transport Block, 传输块)。作为一个子实施例, 所述码块是 TB (Transport Block, 传输块) 中的一部分。

具体的, 根据本发明的一个方面, 上述方法的特征在于, 所述 X 个时间间隔中的任意一个时间间隔在时域都属于第一时间窗, 所述第一时间窗的时间长度是预定义的, 所述第一时间窗被分成 Y 个时间间隔, 所述 X 个时间间隔是所述 Y 个时间间隔中的 X 个, 所述 Y 是不小于 X 的正整数, 所述所述第一子频带中所包括的子载波的子载波间隔被用于确定所述 Y , 所述第一信令的监测者的特征 ID 被用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

作为一个实施例, 所述第一时间窗的时间长度是固定不变的。

作为一个实施例, 所述第一时间窗中包括正整数个时域连续的多载波符号。作为一个子实施例, 所述多载波符号包括数据符号和 CP (Cyclic Prefix, 循环前缀)。

作为一个实施例, 所述所述第一时间窗的时间长度为 1 毫秒。

作为一个实施例, 所述所述第一时间窗的时间长度为 10 毫秒。

作为一个实施例, 所述第一时间窗为一个子帧 (Subframe)。

作为一个实施例, 所述第一时间窗为一个无线帧 (Radio Frame)。

作为一个实施例, 所述 Y 个时间间隔中的任意两个时间间隔的时间长度相等。

作为一个实施例, 所述 Y 个时间间隔中存在两个时间间隔的时间长度不等。

作为一个实施例, 所述 Y 大于所述 X 。

作为一个实施例, 所述 Y 与所述所述第一频带中所包括的子载波的

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子载波间隔成正比。

作为一个实施例，所述所述第一频带中所包括的子载波的子载波间隔被所述用户设备用于确定所述 Y。

作为一个实施例，所述所述第一频带中所包括的子载波的子载波间隔被所述用户设备基于给定的映射关系确定所述 Y。

作为一个实施例，所述所述第一信令的监测者的特征 ID 被所述用户设备用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

作为一个实施例，所述所述第一信令的监测者的特征 ID 被所述用户设备基于给定的映射关系在所述 Y 个时间间隔中确定所述 X 个时间间隔。

作为一个实施例，所述特征 ID 指 IMSI (International Mobile Subscriber Identification Number 国际移动用户识别码)。

作为一个实施例，所述特征 ID 指 IMSI (International Mobile Subscriber Identification Number 国际移动用户识别码) 对 1024 的余数。

作为一个实施例，所述特征 ID 指 IMSI (International Mobile Subscriber Identification Number 国际移动用户识别码) 对 4096 的余数。

作为一个实施例，所述特征 ID 指 IMSI (International Mobile Subscriber Identification Number 国际移动用户识别码) 对 16384 的余数。

作为一个实施例，所述特征 ID 是指 C-RNTI (Cell Radio Network Temporary Identity, 小区无线网络临时标识)。

作为一个实施例，所述第一信令的发送小区的物理小区 ID 被用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

具体的，根据本发明的一个方面，上述方法的特征在于，所述第一时间窗属于 Z 个时间窗中之一，所述 Z 是大于 1 的整数。所述 Z 是预定义的；或者所述 Z 是可配置的。所述 Z 个时间窗中的任意两个时间窗的时间长度是相等的，所述所述第一信令的监测者的特征 ID 被用于在所述 Z 个时间窗中确定所述第一时间窗。

作为一个实施例，所述 Z 等于 10。

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作为一个实施例,所述 Z 个时间窗中的任意两个时间窗在时域正交。

作为一个实施例,所述 Z 个时间窗中的任意一个时间窗为一个子帧,所述 Z 等于 10。

作为一个实施例,所述 Z 个时间窗中的任意一个时间窗为一个无线帧,所述 Z 等于非连续接收周期 (DRX (Discontinuous Reception) cycle) 所包含的无线帧的数量。

作为一个实施例,所述步骤 A 还包括如下步骤:

– 步骤 A2. 接收第三信令。

其中,所述第三信令被用于配置所述 Z 。

作为一个实施例,所述所述第一信令的监测者的特征 ID 被所述用户设备用于在所述 Z 个时间窗中确定所述第一时间窗。

作为一个实施例,所述所述第一信令的监测者的特征 ID 被所述用户设备基于给定的映射关系在所述 Z 个时间窗中确定所述第一时间窗。

作为一个实施例,所述 Z 个时间窗中的任意一个时间窗为一个无线帧,所述第一时间窗由下式得到:

$$SFN \bmod Z = (Z \operatorname{div} N) * (UE_ID \bmod N)$$

其中, SFN 为所述第一时间窗对应的无线帧的帧号, $N = \min(Z, nB)$, nB 等于 $\{4Z, 2Z, Z, Z/2, Z/4, Z/8, Z/16, Z/32, Z/64, Z/128, Z/256, Z/512, Z/1024\}$ 中之一。

具体的,根据本发明的一个方面,上述方法的特征在于,所述步骤 A 还包括如下步骤:

– 步骤 A0. 接收第二无线信号。

其中,所述第二无线信号被用于确定 {所述所述第一子频带在频域的位置,所述所述第一子频带中所包括的子载波子载波间隔} 中至少之一。

作为一个实施例,所述第二无线信号包括主同步信号 (PSS, Primary Synchronization Signal)。

作为一个实施例,所述第二无线信号包括辅同步信号 (SSS, Secondary Synchronization Signal)。

作为一个实施例,所述第二无线信号通过 BCH (Broadcast Channel, 广播信道) 传输。

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作为一个实施例,所述第二无线信号通过PBCH(Physical Broadcast Channel, 物理广播信道)传输。

作为一个实施例,所述第二无线信号通过PDSCH(Physical Downlink Shared Channel, 物理下行共享信道)传输。

作为一个实施例,所述第二无线信号携带MIB(Master Information Block, 主信息块)信息。

作为一个实施例,所述第二无线信号携带SIB(System Information Block, 系统信息块)信息。

作为一个实施例,所述第二无线信号所携带的信息是被周期性传输的。

作为一个实施例,所述第二无线信号所携带的信息是按需(On-Demand)传输的。

作为一个实施例,所述第二无线信号携带第一信息,所述第一信息被用于确定{所述所述第一子频带在频域的位置,所述所述第一子频带中所包括的子载波的子载波间隔}中至少之一。

作为一个实施例,所述第二无线信号携带第一信息,所述第一信息指示{所述所述第一子频带在频域的位置,所述所述第一子频带中所包括的子载波的子载波间隔}中至少之一。

作为一个实施例,所述第二无线信号被所述用户设备用于确定{所述所述第一子频带在频域的位置,所述所述第一子频带中所包括的子载波的子载波间隔}中至少之一。

作为一个实施例,所述第二无线信号指示{所述所述第一子频带在频域的位置,所述所述第一子频带中所包括的子载波的子载波间隔}中至少之一。

具体的,根据本发明的一个方面,上述方法的特征在于,所述步骤A还包括如下步骤:

- 步骤A1. 接收第二信令。

其中,所述第二信令被用于确定Q个子频带,所述第一子频带属于所述Q个子频带中之一,所述Q个子频带中的任意一个子频带包括正整数个连续的子载波,所述所述第一信令的监测者的特征ID被用于在所述Q个子频带中确定所述第一子频带,所述Q是正整数。

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作为一个实施例，所述 Q 个子频带中的任意一个子频带所包括的子载波的子载波间隔都相等。

作为一个实施例，所述 Q 个子频带中任意两个子频带中的子载波的子载波间隔不同。

作为一个实施例，所述 Q 个子频带中存在两个子频带中的子载波的子载波间隔相同。

作为一个实施例，所述 Q 个子频带中任意两个子频带的频域带宽相同。

作为一个实施例，所述 Q 个子频带中存在两个子频带的频域带宽不相等。

作为一个实施例，所述 Q 个子频带都属于同一个载波 (Carrier)。

作为一个实施例，所述 Q 个子频带中存在两个子频带属于不同的载波 (Carrier)。

作为一个实施例，所述第二信令是高层信令。

作为一个实施例，所述第二信令是物理层信令。

作为一个实施例，所述第二信令是通过 BCH (Broadcast Channel, 广播信道) 传输的。

作为一个实施例，所述第二信令是通过 PBCH (Physical Broadcast Channel, 物理广播信道) 传输的。

作为一个实施例，所述第二信令是通过 PDSCH (Physical Downlink Shared Channel, 物理下行共享信道) 传输的。

作为一个实施例，所述第二信令是 RRC (Radio Resource Control, 无线资源控制) 信令。

作为一个实施例，所述第二信令是 SIB (System Information Block, 系统信息块)。

作为一个实施例，所述第二信令是通过 DCI 传输的。

作为一个实施例，所述所述第一信令的监测者的特征 ID 被所述用户设备用于在所述 Q 个子频带中确定所述第一子频带。

作为一个实施例，所述所述第一信令的监测者的特征 ID 被所述用户设备基于特定的映射关系在所述 Q 个子频带中确定所述第一子频带。

本发明公开了一种用于寻呼的基站中的方法，其中，包括如下步骤：

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– 步骤 A. 在 X 个时间间隔中的正整数个时间间隔中分别发送第一信令；

– 步骤 B. 发送第一无线信号。

其中，所述 X 是正整数，所述第一信令被用于确定所述第一无线信号的调度信息，所述调度信息包括{所占用的时频资源，所采用的 MCS，所占用的频域资源中的子载波的子载波间隔}中至少之一，所述第一无线信号携带寻呼消息。传输所述第一信令所使用的频域资源属于第一子频带，所述第一子频带在频域包括正整数个连续的子载波，{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波的子载波间隔}中至少之一被用于确定所述 X 个时间间隔。

具体的，根据本发明的一个方面，上述方法的特征在于，所述 X 个时间间隔中的任意一个时间间隔在时域都属于第一时间窗，所述第一时间窗的时间长度是预定义的，所述第一时间窗被分成 Y 个时间间隔，所述 X 个时间间隔是所述 Y 个时间间隔中的 X 个，所述 Y 是不小于 X 的正整数，所述所述第一子频带中所包括的子载波的子载波间隔被用于确定所述 Y，所述第一信令的监测者的特征 ID 被用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

具体的，根据本发明的一个方面，上述方法的特征在于，所述第一时间窗属于 Z 个时间窗中之一，所述 Z 是大于 1 的整数。所述 Z 是预定义的；或者所述 Z 是可配置的。所述 Z 个时间窗中的任意两个时间窗的时间长度是相等的，所述所述第一信令的监测者的特征 ID 被用于在所述 Z 个时间窗中确定所述第一时间窗。

具体的，根据本发明的一个方面，上述方法的特征在于，所述步骤 A 还包括如下步骤：

– 步骤 A0. 发送第二无线信号。

其中，所述第二无线信号被用于确定{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波的子载波间隔}中至少之一。

具体的，根据本发明的一个方面，上述方法的特征在于，所述步骤 A 还包括如下步骤：

– 步骤 A1. 发送第二信令。

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其中，所述第二信令被用于确定 Q 个子频带，所述第一子频带属于所述 Q 个子频带中之一，所述 Q 个子频带中的任意一个子频带包括正整数个连续的子载波，所述所述第一信令的监测者的特征 ID 被用于在所述 Q 个子频带中确定所述第一子频带，所述 Q 是正整数。

本发明公开了一种用于寻呼的用户设备，其中，包括如下模块：

- 第一接收模块：用于在 X 个时间间隔中分别监测第一信令；
- 第二接收模块：用于接收第一无线信号。

其中，所述 X 是正整数，所述第一信令被用于确定所述第一无线信号的调度信息，所述调度信息包括{所占用的时频资源，所采用的 MCS，所占用的频域资源中的子载波的子载波间隔}中至少之一，所述第一无线信号携带寻呼消息。传输所述第一信令所使用的频域资源属于第一子频带，所述第一子频带在频域包括正整数个连续的子载波，{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波的子载波间隔}中至少之一被用于确定所述 X 个时间间隔。

具体的，根据本发明的一个方面，上述用户设备的特征在于，所述 X 个时间间隔中的任意一个时间间隔在时域都属于第一时间窗，所述第一时间窗的时间长度是预定义的，所述第一时间窗被分成 Y 个时间间隔，所述 X 个时间间隔是所述 Y 个时间间隔中的 X 个，所述 Y 是不小于 X 的正整数，所述所述第一子频带中所包括的子载波的子载波间隔被用于确定所述 Y ，所述第一信令的监测者的特征 ID 被用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

具体的，根据本发明的一个方面，上述用户设备的特征在于，所述第一时间窗属于 Z 个时间窗中之一，所述 Z 是大于 1 的整数。所述 Z 是预定义的；或者所述 Z 是可配置的。所述 Z 个时间窗中的任意两个时间窗的时间长度是相等的，所述所述第一信令的监测者的特征 ID 被用于在所述 Z 个时间窗中确定所述第一时间窗。

具体的，根据本发明的一个方面，上述用户设备的特征在于，所述第一接收模块还被用于接收第二无线信号。所述第二无线信号被用于确定{所述所述第一子频带在频域的位置，所述所述第一子频带中所包括的子载波的子载波间隔}中至少之一。

具体的，根据本发明的一个方面，上述用户设备的特征在于，所述

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第一接收模块还被用于接收第二信令。所述第二信令被用于确定 Q 个子频带，所述第一子频带属于所述 Q 个子频带中之一，所述 Q 个子频带中的任意一个子频带包括正整数个连续的子载波，所述所述第一信令的监测者的特征 ID 被用于在所述 Q 个子频带中确定所述第一子频带，所述 Q 是正整数。

本发明公开了一种用于寻呼的基站设备，其中，包括如下模块：

- 第一发送模块：用于在 X 个时间间隔中的正整数个时间间隔中分别发送第一信令；

- 第二发送模块：用于发送第一无线信号。

其中，所述 X 是正整数，所述第一信令被用于确定所述第一无线信号的调度信息，所述调度信息包括{所占用的时频资源，所采用的 MCS，所占用的频域资源中的子载波子载波间隔}中至少之一，所述第一无线信号携带寻呼消息。传输所述第一信令所使用的频域资源属于第一子频带，所述第一子频带在频域包括正整数个连续的子载波，{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波子载波间隔}中至少之一被用于确定所述 X 个时间间隔。

具体的，根据本发明的一个方面，上述基站设备的特征在于，所述 X 个时间间隔中的任意一个时间间隔在时域都属于第一时间窗，所述第一时间窗的时间长度是预定义的，所述第一时间窗被分成 Y 个时间间隔，所述 X 个时间间隔是所述 Y 个时间间隔中的 X 个，所述 Y 是不小于 X 的正整数，所述所述第一子频带中所包括的子载波子载波间隔被用于确定所述 Y ，所述第一信令的监测者的特征 ID 被用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

具体的，根据本发明的一个方面，上述基站设备的特征在于，所述第一时间窗属于 Z 个时间窗中之一，所述 Z 是大于 1 的整数。所述 Z 是预定义的；或者所述 Z 是可配置的。所述 Z 个时间窗中的任意两个时间窗的时间长度是相等的，所述所述第一信令的监测者的特征 ID 被用于在所述 Z 个时间窗中确定所述第一时间窗。

具体的，根据本发明的一个方面，上述基站设备的特征在于，所述第一发送模块还被用于发送第二无线信号。所述第二无线信号被用于确定{所述第一子频带在频域的位置，所述第一子频带中所包括

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的子载波的子载波间隔}中至少之一。

具体的,根据本发明的一个方面,上述基站设备的特征在于,所述第一发送模块还被用于发送第二信令。所述第二信令被用于确定 Q 个子频带,所述第一子频带属于所述 Q 个子频带中之一,所述 Q 个子频带中的任意一个子频带包括正整数个连续的子载波,所述所述第一信令的监测者的特征ID被用于在所述 Q 个子频带中确定所述第一子频带,所述 Q 是正整数。

附图说明

通过阅读参照以下附图所作的对非限制性实施例所作的详细描述,本发明的其它特征、目的和优点将会变得更加明显:

图1示出了根据本发明的一个实施例的无线信号传输流程图;

图2示出了根据本发明的一个实施例的 Z 个时间窗和 Q 个子频带的关系的示意图;

图3示出了根据本发明的一个实施例的第一时间窗与 X 个时间间隔的关系的示意图;

图4示出了根据本发明的一个实施例的第一信令,第一无线信号和第二无线信号之间的关系的示意图;

图5示出了根据本发明的一个实施例的用户设备(UE)中的处理装置的结构框图;

图6示出了根据本发明的一个实施例的基站中的处理装置的结构框图;

具体实施方式

下文将结合附图对本发明的技术方案作进一步详细说明,需要说明的是,在不冲突的情况下,本申请的实施例和实施例中的特征可以任意相互组合。

实施例1

实施例1示例了根据本发明的一个实施例的无线信号传输流程图,如附图1所示。附图1中,基站N1是UE U2的服务小区的维持基站,虚线框F1中标识的步骤是可选的。

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对于基站 N1，在步骤 S11 中发送第二无线信号，在步骤 S12 中发送第二信令，在步骤 S13 中在 X 个时间间隔中的正整数个时间间隔中分别发送第一信令，在步骤 S14 中发送第一无线信号。

对于UE U2，在步骤 S21 中接收第二无线信号，在步骤 S22 中接收第二信令，在步骤 S23 中在 X 个时间间隔中分别监测第一信令，在步骤 S24 中接收第一无线信号。

在实施例 1 中，所述 X 是正整数，所述第一信令被用于确定所述第一无线信号的调度信息，所述调度信息包括{所占用的时频资源，所采用的 MCS，所占用的频域资源中的子载波的子载波间隔}中至少之一，所述第一无线信号携带寻呼消息。传输所述第一信令所使用的频域资源属于第一子频带，所述第一子频带在频域包括正整数个连续的子载波，{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波的子载波间隔}中至少之一被用于确定所述 X 个时间间隔。所述第二无线信号被用于确定{所述所述第一子频带在频域的位置，所述所述第一子频带中所包括的子载波的子载波间隔}中至少之一。所述第二信令被用于确定 Q 个子频带，所述第一子频带属于所述 Q 个子频带中之一，所述 Q 个子频带中的任意一个子频带包括正整数个连续的子载波，所述所述第一信令的监测者的特征 ID 被用于在所述 Q 个子频带中确定所述第一子频带，所述 Q 是正整数。

在实施例 1 的子实施例 1 中，所述 X 个时间间隔中的任意一个时间间隔在时域都属于第一时间窗，所述第一时间窗的时间长度是预定义的，所述第一时间窗被分成 Y 个时间间隔，所述 X 个时间间隔是所述 Y 个时间间隔中的 X 个，所述 Y 是不小于 X 的正整数，所述所述第一子频带中所包括的子载波的子载波间隔被用于确定所述 Y，所述第一信令的监测者的特征 ID 被用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

在实施例 1 的子实施例 2 中，所述第一时间窗属于 Z 个时间窗中之一，所述 Z 是大于 1 的整数。所述 Z 是预定义的；或者所述 Z 是可配置的。所述 Z 个时间窗中的任意两个时间窗的时间长度是相等的，所述所述第一信令的监测者的特征 ID 被用于在所述 Z 个时间窗中确定所述第一时间窗。

在实施例 1 的子实施例 3 中，所述寻呼消息包括被寻呼的用户设备

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的特征 ID。

在实施例 1 的子实施例 4 中,所述 MCS(Modulation Coding Scheme, 调制编码方式)包括的调制方式为 {QPSK, 16QAM, 64QAM, 256QAM, 1024QAM} 中之一。

在实施例 1 的子实施例 5 中,所述子载波间隔等于 15kHz 乘以 2 的 K 次幂,所述 K 为整数。

在实施例 1 的子实施例 6 中,所述第一子频带 (Subband) 包括 12 的正整数倍个子载波。

在实施例 1 的子实施例 7 中,所述第一子频带中包括的所有子载波的子载波间隔都相等。

在实施例 1 的子实施例 8 中,所述所述第一子频带在频域的位置是指所述第一子频带在所处的载波 (Carrier) 中的位置。

在实施例 1 的子实施例 9 中,所述所述第一子频带在频域的位置是指所述第一子频带所处的载波 (Carrier) 在频域的位置。

在实施例 1 的子实施例 10 中,所述所述第一子频带在频域的位置是指所述第一子频带在所处的载波 (Carrier) 中的子频带索引。

在实施例 1 的子实施例 11 中,所述所述第一子频带在频域的位置是指所述第一子频带在所处的频带 (Band) 所对应的频率资源中的位置。

在实施例 1 的子实施例 12 中,所述第二信令是高层信令。

在实施例 1 的子实施例 13 中,所述第二信令是物理层信令。

在实施例 1 的子实施例 14 中,所述第二信令是通过 BCH(Broadcast Channel, 广播信道) 传输的。

在实施例 1 的子实施例 15 中,所述第二信令是通过 PBCH(Physical Broadcast Channel, 物理广播信道) 传输的。

在实施例 1 的子实施例 16 中,所述第二信令是通过 PDSCH(Physical Downlink Shared Channel, 物理下行共享信道) 传输的。

在实施例 1 的子实施例 17 中,所述第二信令是 RRC(Radio Resource Control, 无线资源控制) 信令。

在实施例 1 的子实施例 18 中,所述第二信令是 SIB (System Information Block, 系统信息块)。

在实施例 1 的子实施例 19 中,所述第二信令是通过 DCI 传输的。

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实施例 2

实施例 2 示例了根据本发明的一个实施例的 Z 个时间窗和 Q 个子频带的关系的示意图，如附图 2 所示。附图 2 中，横轴代表时间，纵轴代表频率，每个矩形代表一个时间间隔，斜线填充的矩形代表 UE#1 在时间窗#a中所监测的 $X1$ 个时间间隔，十字线填充的矩形代表 UE#2 在时间窗#b中所监测的 $X2$ 个时间间隔，斜线交叉线填充的矩形代表 UE#3 在时间窗#c中所监测的 $X3$ 个时间间隔。

在实施例 2 中，对于 UE#1，在 $X1$ 个时间间隔中分别监测第一信令，传输所述第一信令所使用的频域资源属于子频带#1，所述子频带#1 在频域包括正整数个连续的子载波，{所述子频带#1 在频域的位置，所述子频带#1 所包括的子载波子载波间隔}中至少之一被用于确定所述 $X1$ 个时间间隔。所述 $X1$ 个时间间隔中的任意一个时间间隔在时域都属于时间窗#a，所述时间窗#a 的时间长度是预定义的，所述时间窗#a 被分成 $Y1$ 个时间间隔，所述 $X1$ 个时间间隔是所述 $Y1$ 个时间间隔中的 $X1$ 个，所述 $Y1$ 是不小于 $X1$ 的正整数，所述子频带#1 中所包括的子载波子载波间隔被用于确定所述 $Y1$ ，所述 UE#1 的特征 ID 被用于在所述 $Y1$ 个时间间隔中确定所述 $X1$ 个时间间隔。所述时间窗#a 属于 Z 个时间窗中之一，所述 Z 是大于 1 的整数。所述 Z 是预定义的；或者所述 Z 是可配置的。所述 Z 个时间窗中的任意两个时间窗的时间长度是相等的，所述 UE#1 的特征 ID 被用于在所述 Z 个时间窗中确定所述时间窗#a。所述子频带#1 属于所述 Q 个子频带中之一，所述 Q 个子频带中的任意一个子频带包括正整数个连续的子载波，所述 UE#1 的特征 ID 被用于在所述 Q 个子频带中确定所述子频带#1，所述 Q 是正整数。

在实施例 2 的子实施例 1 中，所述 Z 等于 10。

在实施例 2 的子实施例 2 中，所述 Z 个时间窗中的任意两个时间窗在时域正交。

在实施例 2 的子实施例 3 中，所述 Z 个时间窗中的任意一个时间窗为一个子帧，所述 Z 等于 10。

在实施例 2 的子实施例 4 中，所述 Z 个时间窗中的任意一个时间窗为一个无线帧，所述 Z 等于非连续接收周期 (DRX (Discontinuous

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Reception) cycle) 所包含的无线帧的数量。

在实施例 2 的子实施例 5 中, 所述 Z 个时间窗中的任意一个时间窗为一个无线帧, 所述时间窗#a 由下式得到:

$$\text{SFN mod } Z = (Z \text{ div } N) * (\text{UE_ID mod } N)$$

其中, SFN 为所述时间窗#a 对应的无线帧的帧号, $N = \min(Z, nB)$, nB 等于 {4Z, 2Z, Z, Z/2, Z/4, Z/8, Z/16, Z/32, Z/64, Z/128, Z/256, Z/512, Z/1024} 中之一。

在实施例 2 的子实施例 6 中, 所述 Q 个子频带中的任意一个子频带所包括的子载波子载波间隔都相等。

在实施例 2 的子实施例 7 中, 所述 Q 个子频带中任意两个子频带中的子载波子载波间隔不同。

在实施例 2 的子实施例 8 中, 所述 Q 个子频带中存在两个子频带中的子载波子载波间隔相同。

在实施例 2 的子实施例 9 中, 所述 Q 个子频带中任意两个子频带的频域带宽相同。

在实施例 2 的子实施例 10 中, 所述 Q 个子频带中存在两个子频带的频域带宽不相等。

在实施例 2 的子实施例 11 中, 所述 Q 个子频带都属于同一个载波 (Carrier)。

在实施例 2 的子实施例 12 中, 所述 Q 个子频带中存在两个子频带属于不同的载波 (Carrier)。

实施例 3

实施例 3 示例了根据本发明的一个实施例的第一时间窗与 X 个时间间隔的关系的示意图, 如附图 3 所示。在附图 3 中, 列出了依据不同的 Y 值和不同的 UE 的特征 ID, X=1 个时间间隔在第一时间窗中的索引。

在实施例 3 中, UE 在 X 个时间间隔中分别监测第一信令, 所述 X 个时间间隔中的任意一个时间间隔在时域都属于第一时间窗, 所述第一时间窗的时间长度是预定义的, 所述第一时间窗被分成 Y 个时间间隔, 所述 X 个时间间隔是所述 Y 个时间间隔中的 X 个, 所述 Y 是不小于 X 的正整数, 所述所述第一子频带中所包括的子载波子载波间隔被用于确定所述 Y, 所

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述 UE 的特征 ID 被用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

在实施例 3 的子实施例 1 中，在所述 X 个时间间隔中的每一个时间间隔中针对所述第一信令最多执行 P 次检测，所述 P 是正整数。

在实施例 3 的子实施例 2 中，所述 X 个时间间隔中的任意两个时间间隔的时间长度相等。

在实施例 3 的子实施例 3 中，所述 X 个时间间隔中存在两个时间间隔的时间长度不等。

在实施例 3 的子实施例 4 中，所述 X 个时间间隔中的任意一个时间间隔为一个时隙 (Slot)。

在实施例 3 的子实施例 5 中，所述 X 个时间间隔中的任意两个时间间隔的时间长度相等，所述 X 个时间间隔中的每个时间间隔的时间长度和所述第一频带中所包括的子载波的子载波间隔有关。

在实施例 3 的子实施例 6 中，所述 X 个时间间隔中的任意一个时间间隔为 M 个 OFDM (Orthogonal Frequency Division Multiplexing, 正交频分复用) 符号，所述 M 为小于 14 的正整数。

在实施例 3 的子实施例 7 中，所述 X 个时间间隔中的任意一个时间间隔为 M 个 OFDM (Orthogonal Frequency Division Multiplexing, 正交频分复用) 符号，所述 M 为小于 7 的正整数。

在实施例 3 的子实施例 8 中，所述 X 个时间间隔中的任意两个时间间隔在时域正交，所述正交是指不存在一个时间单元同时属于所述 X 个时间间隔中的任意两个时间间隔。

在实施例 3 的子实施例 9 中，所述 X 个时间间隔中存在两个时间间隔在时域是离散的。

在实施例 3 的子实施例 10 中，所述第一时间窗的时间长度是固定不变的。

在实施例 3 的子实施例 11 中，所述第一时间窗中包括正整数个时域连续的多载波符号。作为一个子实施例，所述多载波符号包括数据符号和 CP (Cyclic Prefix, 循环前缀)。

在实施例 3 的子实施例 12 中，所述所述第一时间窗的时间长度为 1 毫秒。

在实施例 3 的子实施例 13 中，所述所述第一时间窗的时间长度为 10

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毫秒。

在实施例 3 的子实施例 14 中,所述第一时间窗为一个子帧(Subframe)。

在实施例 3 的子实施例 15 中,所述第一时间窗为一个无线帧(Radio Frame)。

在实施例 3 的子实施例 16 中,所述 Y 个时间间隔中的任意两个时间间隔的时间长度相等。

在实施例 3 的子实施例 17 中,所述 Y 与所述第一频带中所包括的子载波的子载波间隔成正比。

在实施例 3 的子实施例 18 中,所述特征 ID 指 IMSI (International Mobile Subscriber Identification Number 国际移动用户识别码)。

在实施例 3 的子实施例 19 中,所述特征 ID 指 IMSI (International Mobile Subscriber Identification Number 国际移动用户识别码)对 1024 的余数。

在实施例 3 的子实施例 20 中,所述特征 ID 指 IMSI (International Mobile Subscriber Identification Number 国际移动用户识别码)对 4096 的余数。

在实施例 3 的子实施例 21 中,所述特征 ID 指 IMSI (International Mobile Subscriber Identification Number 国际移动用户识别码)对 16384 的余数。

在实施例 3 的子实施例 22 中,所述特征 ID 是指 C-RNTI (Cell Radio Network Temporary Identity, 小区无线网络临时标识)。

实施例 4

实施例 4 示例了根据本发明的一个实施例的第一信令,第一无线信号和第二无线信号之间的关系的示意图,如附图 4 所示。附图 4 中,横轴代表时间,纵轴代表频率,斜线填充的矩形代表传输第二无线信号所占用的时频资源,十字线填充的矩形代表传输第一信令所占用的时频资源,斜线交叉线填充的矩形代表传输第一无线信号所占用的时频资源,虚线箭头代表了特定的使用关系。

在实施例 4 中,第一信令被用于确定第一无线信号的调度信息,所述调度信息包括{所占用的时频资源,所采用的 MCS,所占用的频域资源中的

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子载波的子载波间隔}中至少之一,传输所述第一信令所使用的频域资源属于第一子频带,所述第一子频带在频域包括正整数个连续的子载波。第二无线信号被用于确定{所述第一子频带在频域的位置,所述第一子频带中所包括的子载波的子载波间隔}中至少之一。

在实施例4的子实施例1中,所述第一信令是物理层信令。

在实施例4的子实施例2中,所述第一信令是DCI(Downlink Control Information,下行控制信息)。

在实施例4的子实施例3中,所述第一信令通过NR-PDCCH(New Radio Physical Downlink Control Channel,新空口物理下行控制信道)传输。

在实施例4的子实施例4中,所述第一信令通过PDCCH(Physical Downlink Control Channel,物理下行控制信道)传输,所述PDCCH的CRC(Cyclic Redundancy Check,循环冗余校验)经过P-RNTI(Paging Radio Network Temporary Identity,寻呼无线网络临时标识)加扰。

在实施例4的子实施例5中,所述第一无线信号通过DL-SCH(Downlink Shared Channel,下行共享信道)传输。

在实施例4的子实施例6中,所述第一无线信号通过PDSCH(Physical Downlink Shared Channel,物理下行共享信道)传输。

在实施例4的子实施例7中,第一比特块依次经过调制映射器(Modulation Mapper),层映射器(Layer Mapper),预编码(Precoding),资源元素映射器(Resource Element Mapper),OFDM信号发生(Generation)之后得到所述第一无线信号。所述第一比特块包括一个码块经过信道编码之后的输出。作为一个子实施例,所述码块是TB(Transport Block,传输块)。作为一个子实施例,所述码块是TB(Transport Block,传输块)中的一部分。

在实施例4的子实施例8中,所述第二无线信号包括主同步信号(PSS, Primary Synchronization Signal)。

在实施例4的子实施例9中,所述第二无线信号包括辅同步信号(SSS, Secondary Synchronization Signal)。

在实施例4的子实施例10中,所述第二无线信号通过BCH(Broadcast Channel,广播信道)传输。

在实施例4的子实施例11中,所述第二无线信号通过PBCH(Physical

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Broadcast Channel, 物理广播信道) 传输。

在实施例 4 的子实施例 12 中, 所述第二无线信号携带 MIB (Master Information Block, 主信息块) 信息。

在实施例 4 的子实施例 13 中, 所述第二无线信号携带 SIB (System Information Block, 系统信息块) 信息。

在实施例 4 的子实施例 14 中, 所述第二无线信号所携带的信息是被周期性传输的。

在实施例 4 的子实施例 15 中, 所述第二无线所携带的信息是按需 (On-Demand) 传输的。

在实施例 4 的子实施例 16 中, 所述第二无线信号携带第一信息, 所述第一信息被用于确定 {所述所述第一子频带在频域的位置, 所述所述第一子频带中所包括的子载波子载波间隔} 中至少之一。

在实施例 4 的子实施例 17 中, 所述第二无线信号携带第一信息, 所述第一信息指示 {所述所述第一子频带在频域的位置, 所述所述第一子频带中所包括的子载波子载波间隔} 中至少之一。

实施例 5

实施例 5 示例了一个用户设备中的处理装置的结构框图, 如附图 5 所示。附图 5 中, 用户设备处理装置 100 主要由第一接收模块 101 和第二接收模块 102 组成。

在实施例 5 中, 第一接收模块 101 被用于在 X 个时间间隔中分别监测第一信令, 第二接收模块 102 被用于接收第一无线信号。其中, 所述 X 是正整数, 所述第一信令被用于确定所述第一无线信号的调度信息, 所述调度信息包括 {所占用的时频资源, 所采用的 MCS, 所占用的频域资源中的子载波子载波间隔} 中至少之一, 所述第一无线信号携带寻呼消息。传输所述第一信令所使用的频域资源属于第一子频带, 所述第一子频带在频域包括正整数个连续子载波, {所述第一子频带在频域的位置, 所述第一子频带中所包括的子载波子载波间隔} 中至少之一被用于确定所述 X 个时间间隔。

在实施例 5 的子实施例 1 中, 所述 X 个时间间隔中的任意一个时间间隔在时域都属于第一时间窗, 所述第一时间窗的时间长度是预定义

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的，所述第一时间窗被分成 Y 个时间间隔，所述 X 个时间间隔是所述 Y 个时间间隔中的 X 个，所述 Y 是不小于 X 的正整数，所述所述第一子频带中所包括的子载波子载波间隔被用于确定所述 Y ，所述第一信令的监测者的特征 ID 被用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

在实施例 5 的子实施例 2 中，所述第一时间窗属于 Z 个时间窗中之一，所述 Z 是大于 1 的整数。所述 Z 是预定义的；或者所述 Z 是可配置的。所述 Z 个时间窗中的任意两个时间窗的时间长度是相等的，所述所述第一信令的监测者的特征 ID 被用于在所述 Z 个时间窗中确定所述第一时间窗。

在实施例 5 的子实施例 3 中，第一接收模块 101 还被用于接收第二无线信号。所述第二无线信号被用于确定 {所述所述第一子频带在频域的位置，所述所述第一子频带中所包括的子载波子载波间隔} 中至少之一。

在实施例 5 的子实施例 4 中，第一接收模块 101 还被用于接收第二信令。所述第二信令被用于确定 Q 个子频带，所述第一子频带属于所述 Q 个子频带中之一，所述 Q 个子频带中的任意一个子频带包括正整数个连续的子载波，所述所述第一信令的监测者的特征 ID 被用于在所述 Q 个子频带中确定所述第一子频带，所述 Q 是正整数。

实施例 6

实施例 6 示例了一个基站设备中的处理装置的结构框图，如附图 6 所示。在附图 6 中，基站处理装置 200 主要由第一发送模块 201 和第二发送模块 202 组成。

在实施例 6 中，第一发送模块 201 被用于在 X 个时间间隔中的正整数个时间间隔中分别发送第一信令，第二发送模块 202 被用于发送第一无线信号。其中，所述 X 是正整数，所述第一信令被用于确定所述第一无线信号的调度信息，所述调度信息包括 {所占用的时频资源，所采用的 MCS，所占用的频域资源中的子载波子载波间隔} 中至少之一，所述第一无线信号携带寻呼消息。传输所述第一信令所使用的频域资源属于第一子频带，所述第一子频带在频域包括正整数个连续的子载波，{所述第一子频带在频域的位置，所述第一子频带中所包括的子载波子载波间隔} 中至少之一。

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波间隔}中至少之一被用于确定所述 X 个时间间隔。

在实施例 6 的子实施例 1 中，所述 X 个时间间隔中的任意一个时间间隔在时域都属于第一时间窗，所述第一时间窗的时间长度是预定义的，所述第一时间窗被分成 Y 个时间间隔，所述 X 个时间间隔是所述 Y 个时间间隔中的 X 个，所述 Y 是不小于 X 的正整数，所述所述第一子频带中所包括的子载波子载波间隔被用于确定所述 Y，所述第一信令的监测者的特征 ID 被用于在所述 Y 个时间间隔中确定所述 X 个时间间隔。

在实施例 6 的子实施例 2 中，所述第一时间窗属于 Z 个时间窗中之一，所述 Z 是大于 1 的整数。所述 Z 是预定义的；或者所述 Z 是可配置的。所述 Z 个时间窗中的任意两个时间窗的时间长度是相等的，所述所述第一信令的监测者的特征 ID 被用于在所述 Z 个时间窗中确定所述第一时间窗。

在实施例 6 的子实施例 3 中，第一发送模块 201 还被用于发送第二无线信号。所述第二无线信号被用于确定{所述所述第一子频带在频域的位置，所述所述第一子频带中所包括的子载波子载波间隔}中至少之一。

在实施例 6 的子实施例 4 中，第一发送模块 201 还被用于发送第二信令。所述第二信令被用于确定 Q 个子频带，所述第一子频带属于所述 Q 个子频带中之一，所述 Q 个子频带中的任意一个子频带包括正整数个连续的子载波，所述所述第一信令的监测者的特征 ID 被用于在所述 Q 个子频带中确定所述第一子频带，所述 Q 是正整数。

本领域普通技术人员可以理解上述方法中的全部或部分步骤可以通过程序来指令相关硬件完成，所述程序可以存储于计算机可读存储介质中，如只读存储器，硬盘或者光盘等。可选的，上述实施例的全部或部分步骤也可以使用一个或者多个集成电路来实现。相应的，上述实施例中的各模块单元，可以采用硬件形式实现，也可以由软件功能模块的形式实现，本申请不限于任何特定形式的软件和硬件的结合。本发明中的 UE 或者终端包括但不限于手机，平板电脑，笔记本，上网卡，低功耗设备，eMTC 设备，NB-IoT 设备，无人机，遥控飞机，车载通信设备等无线通信设备。本发明中的基站或者网络侧设备包括但不限于宏蜂窝



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基站，微蜂窝基站，家庭基站，中继基站，eNB，gNB，传输接收节点 TRP 等无线通信设备。

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说明书附图

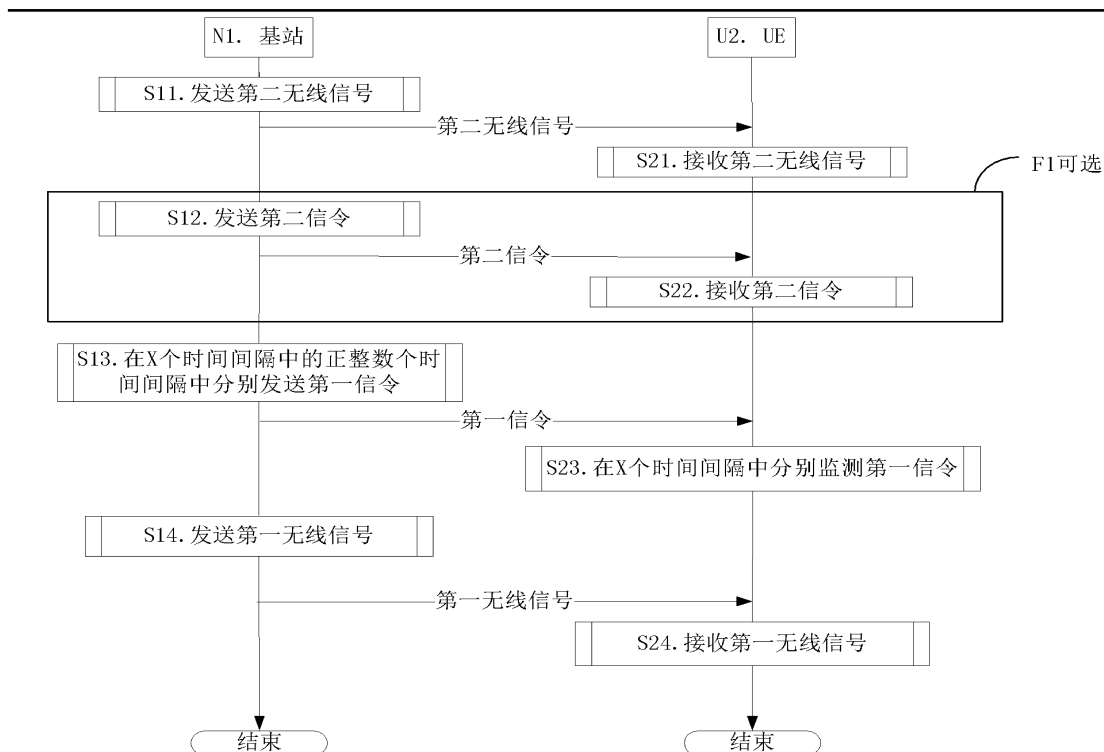


图 1

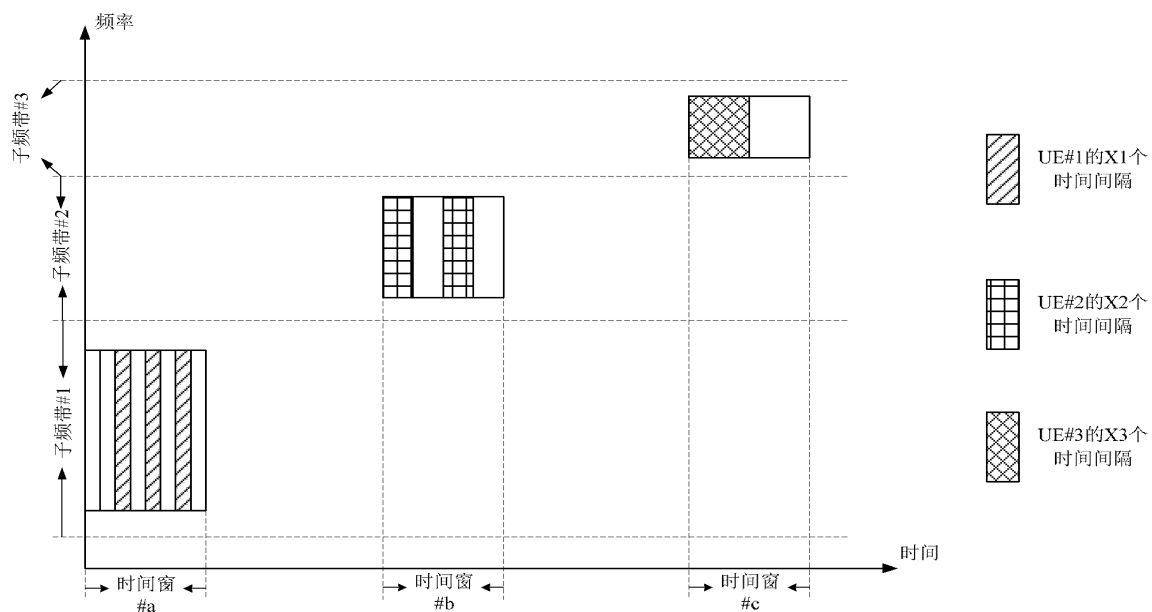


图 2



说明书附图

	X=1 个时间间隔在第一时间窗中的索引			
	特征 ID = a	特征 ID = b	特征 ID = c	特征 ID = d
Y=1	0	0	0	0
Y=2	0	1	0	1
Y=4	0	1	2	3
Y=8	1	3	5	7
Y=16	2	6	10	14

图 3

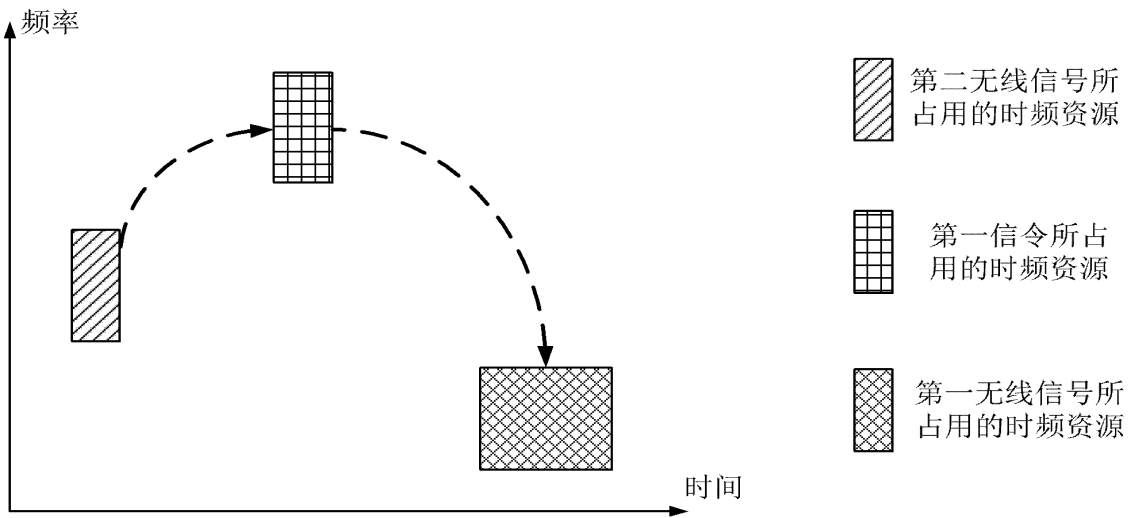


图 4

说明书附图

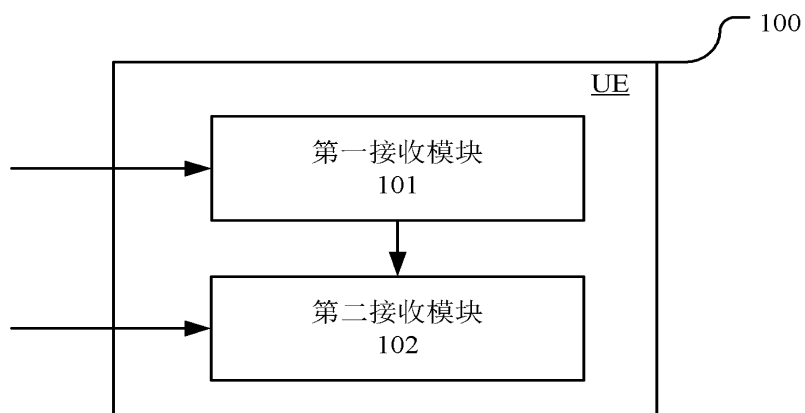


图 5

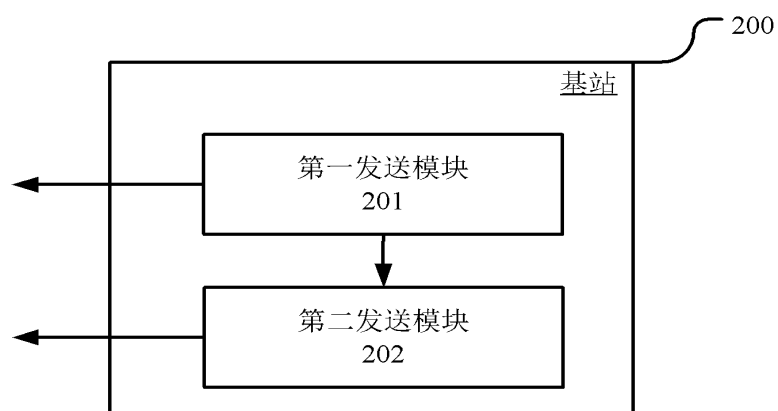


图 6



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United States Patent and Trademark Office
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
15/956,742	04/18/2018	2683	1015	126099-8010.US00	20	4

CONFIRMATION NO. 1787

FILING RECEIPT



0000000099475892

70416

Perkins Coie LLP - SHA General
Patent - SHA
P.O. Box 1247
Seattle, WA 98111-1247

Date Mailed: 05/14/2018

Receipt is acknowledged of this non-provisional 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 APPLICANT, 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 Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections 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**

Inventor(s)

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Applicant(s)

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Assignment For Published Patent Application

Shanghai Langbo Communication Technology Company Limited, Shanghai, CHINA

Power of Attorney: None

Domestic Applications for which benefit is claimed - None.

A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)
CHINA 201710255811.X 04/19/2017

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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Request to Retrieve - This application either claims priority to one or more applications filed in an intellectual property Office that participates in the Priority Document Exchange (PDX) program or contains a proper **Request to Retrieve Electronic Priority Application(s)** (PTO/SB/38 or its equivalent). Consequently, the USPTO will attempt to electronically retrieve these priority documents.

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/956,742**

Projected Publication Date: 10/25/2018

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING

Preliminary Class

340

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

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page 2 of 4

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875						Application or Docket Number 15/956,742				
APPLICATION AS FILED - PART I										
(Column 1)		(Column 2)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY				
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)			
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	75		N/A				
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	330		N/A				
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A				
TOTAL CLAIMS (37 CFR 1.16(i))	20	minus 20 = *	x 50	= 0.00	OR					
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4	minus 3 = *	x 230	= 230						
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						
			TOTAL	1015		TOTAL				
* If the difference in column 1 is less than zero, enter "0" in column 2.										
APPLICATION AS AMENDED - PART II										
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY		OR OTHER THAN SMALL ENTITY		
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	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))							OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	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))							OR		
	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.										

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		
<p>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.</p> <p>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.</p>			

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Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Xiaobo		ZHANG		
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Application Information:

Title of the Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		
Attorney Docket Number	126099-8010.US00	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	6	Suggested Figure for Publication (if any)	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

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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:

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☐ **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.

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Prior Application Status	<input type="text"/>	<input type="button" value="Remove"/>	
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

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Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ^j (if applicable)	Remove
201710255811.X	CN	2017-04-19		

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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

<p>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.</p> <p>☐ 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.</p>
--

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

Authorization or Opt-Out of Authorization to Permit Access:

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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.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

Applicant Information:

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Applicant	1	<input type="button" value="Remove"/>
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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.

☒ 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
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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	Shanghai Langbo Communication Technology Company Limited		
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

Assignee	1		
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If the Assignee or Non-Applicant Assignee is an Organization check here. ☒			
Organization Name	Shanghai Langbo Communication Technology Company Limited		
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Signature	/Aaron Wining, Reg. No. 45,229/		Date (YYYY-MM-DD)	2018-04-19
First Name	Aaron	Last Name	Wining	Registration Number
				45229
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	126099-8010.US00
		Application Number	
Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		

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METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING

BACKGROUND

Cross Reference to Related Application

5 This disclosure claims the priority benefit of Chinese Patent Application 201710255811.X, filed on April 19, 2017, all of which is incorporated herein by reference.

TECHNICAL FIELD

10 [0001] The present disclosure relates to transmission schemes in wireless communication systems, and in particular to a method and a device for paging transmission in a communication system supporting multiple numerologies.

RELATED ART

15 [0002] Application scenarios of future wireless communication systems are becoming increasingly diversified, and different application scenarios have different performance demands on systems. In order to meet different performance requirements of various application scenarios, the 3rd Generation Partner Project (3GPP) Radio Access Network (RAN) #72 plenary session decided to conduct the study of New Radio (NR). The working item of 5G NR was agreed as an approved project to standardize the 5G NR at the 3GPP RAN #75 session.

20 [0003] In order to be applied to various different application scenarios flexibly, future wireless communication systems, especially 5G NR, will support various numerologies. The various numerologies refer to various subcarrier spacings, various symbol time lengths, various Cyclic Prefix (CP) lengths, etc. In order to simplify the design of systems and to reduce the complexity of User Equipment (UE)
25 implementation, the overall design of the system physical layer would best adopt a unified structure for different numerologies.

SUMMARY

 [0004] In existing LTE systems, transmission opportunities of paging are defined through a Paging Frame (PF) and a Paging Occasion (PO) uniformly. The PF is a

radio frame which is likely to transmit a paging message, and the PO is used for determining a subframe which is likely to transmit a paging message in the PF. The radio frame in LTE has a fixed time length of 10 milliseconds, and the subframe has a fixed time length of 1 millisecond. Since an LTE network generally employs a single numerology or the numerology basically does not change in a long time in the network, the definition of the possible time of paging using the PF and PO having a fixed time length can simplify the design of system, under the premise of guaranteeing the paging capacity and not increasing the power consumption of UE. Under the 5G NR, a network supports different numerologies, thus, a given time length, for example, 1 millisecond, probably includes multiple basic scheduling units (for example, slot). If the legacy design of the current paging opportunity is employed, the UE would detect the paging message different times for different numerologies within the 1 millisecond. Therefore, power consumption in some numerology would be greatly increased. Meanwhile, the paging capacity varies greatly due to the adoption of different numerologies.

[0005] In order to solve the above design problem of paging when multiple numerologies are employed in the 5G NR, the present disclosure provides a solution, which determines the transmission opportunities of paging according to the numerology employed by the paging, thereby guaranteeing that the UE has a small difference in the complexity and power consumption of monitoring the paging message under different numerologies and that the paging capacity basically remains the same. It should be noted the embodiments of the UE of the present disclosure and the characteristics in the embodiments may be applied to the base station if no conflict is caused, and vice versa. Further, the embodiments of the present disclosure and the characteristics in the embodiments may be mutually combined if no conflict is caused.

[0006] The present disclosure discloses a method in a UE used for paging. The method includes the following:

[0007] monitoring a first signaling in X time intervals; and

[0008] receiving a first radio signal.

[0009] Herein, X is a positive integer. The first signaling is used for determining scheduling information for the first radio signal. The scheduling information includes

- at least one of {occupied time-frequency resource, adopted Modulation Coding Scheme (MCS), subcarrier spacing of subcarriers in occupied frequency domain resource}. The first radio signal carries a paging message. The frequency domain resource used for transmitting the first signaling belongs to a first subband. The first subband includes a positive integer number of consecutive subcarriers in frequency domain. At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.
- 5
- [0010] In one embodiment, with the above method, the UE can determine the time interval of monitoring a transmitted paging message according to a subcarrier spacing adopted to transmit the paging message, thereby saving power consumption.
- 10
- [0011] In one embodiment, the above method designs a uniform calculation approach of paging opportunity based on different subcarrier spacings. Meanwhile, the paging capacity remains the same when different subcarrier spacings are adopted to transmit the paging message.
- 15
- [0012] In one embodiment, the paging message includes a feature ID of a paged UE.
- [0013] In one embodiment, the first signaling is detected P times at most in each one of the X time intervals, P is a positive integer.
- 20
- [0014] In one embodiment, any two of the X time intervals have an equal time length.
- [0015] In one embodiment, two of the X time times have different time lengths.
- [0016] In one embodiment, any one of the X time intervals is a slot.
- [0017] In one embodiment, any two of the X time intervals have an equal time length, and the time length of each one of the X time intervals is correlated to the subcarrier spacing of subcarriers included in the first subband.
- 25
- [0018] In one embodiment, any one of the X time intervals comprises M Orthogonal Frequency Division Multiplexing (OFDM) symbols, M is a positive integer smaller than 14.
- [0019] In one embodiment, any one of the X time intervals comprises M OFDM symbols, M is a positive integer smaller than 7.
- 30

- [0020] In one embodiment, any two of the X time intervals are orthogonal in time domain, the orthogonality refers that there is no time unit that belongs to any two of the X time intervals simultaneously.
- [0021] In one embodiment, two of the X time intervals are discrete in time domain.
- 5 [0022] In one embodiment, the first signaling is a physical layer signaling.
- [0023] In one embodiment, the first signaling is Downlink Control Information (DCI).
- [0024] In one embodiment, the first signaling is transmitted through a Physical Downlink Control Channel (PDCCH).
- 10 [0025] In one embodiment, the first signaling is transmitted through a New Radio Physical Downlink Control Channel (NR-PDCCH).
- [0026] In one embodiment, the first signaling is transmitted through a PDCCH. The PDCCH is transmitted in a Common Search Space (CSS).
- [0027] In one embodiment, the first signaling is transmitted through a PDCCH, the
- 15 PDCCH is transmitted in a UE-Specific Search Space (USS).
- [0028] In one embodiment, the first signaling is transmitted through a PDCCH, the PDCCH has a Cyclic Redundancy Check (CRC) scrambled by a Paging Radio Network Temporary Identity (P-RNTI).
- [0029] In one embodiment, the MCS includes one of {QPSK, 16QAM, 64QAM,
- 20 256QAM, 1024QAM}.
- [0030] In one embodiment, the subcarrier spacing is equal to 15kHz multiplied by 2 to the K th power, where K is an integer.
- [0031] In one embodiment, the first subband includes a positive integer multiple of 12 subcarriers.
- 25 [0032] In one embodiment, all subcarriers included in the first subband have an equal subcarrier spacing.
- [0033] In one embodiment, the location of the first subband in frequency domain refers to the location of the first subband in a carrier where the first subband is located.

- [0034] In one embodiment, the location of the first subband in frequency domain refers to the location of a carrier where the first subband is located in frequency domain.
- 5 [0035] In one embodiment, the location of the first subband in frequency domain refers to a subband index of the first subband in a carrier where the first subband is located.
- [0036] In one embodiment, the location of the first subband in frequency domain refers to the location of the first subband in a frequency resource corresponding to a band where the first subband is located.
- 10 [0037] In one embodiment, at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for the UE to determine the X time intervals.
- [0038] In one embodiment, at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for the UE to determine the X time intervals based on a given mapping rule.
- 15 [0039] In one embodiment, the first radio signal is transmitted through a Downlink Shared Channel (DL-SCH).
- [0040] In one embodiment, the first radio signal is transmitted through a Physical Downlink Shared Channel (PDSCH).
- 20 [0041] In one embodiment, a first bit block is subjected to a modulation mapper, a layer mapper, precoding, a resource element mapper and OFDM single generation in sequence to obtain the first radio signal; the first bit block includes the output obtained after a code block is subjected to channel coding. In one subembodiment, the code block is a Transport Block (TB). In one subembodiment, the code block is one part of a TB.
- 25 [0042] According to one aspect of the present disclosure, the above method is characterized in that any one of the X time intervals belongs to a first time window in time domain; The time length of the first time window is predefined; The first time window is divided into Y time intervals; The X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; The subcarrier spacing of subcarriers included in the first subband is used for determining Y; A
- 30

feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals.

[0043] In one embodiment, the time length of the first time window is fixed.

5 [0044] In one embodiment, the first time window includes a positive integer number of consecutive multi-carrier symbols.

[0045] In one embodiment, the multi-carrier symbol includes a data symbol and a CP.

[0046] In one embodiment, the first time window has a time length of 1 millisecond.

10 [0047] In one embodiment, the first time window has a time length of 10 milliseconds.

[0048] In one embodiment, the first time window is a subframe.

[0049] In one embodiment, the first time window is a radio frame.

15 [0050] In one embodiment, any two of the Y time intervals have an equal time length.

[0051] In one embodiment, two of the Y time intervals have different time lengths.

[0052] In one embodiment, Y is greater than X.

[0053] In one embodiment, Y is proportional to the subcarrier spacing of subcarriers included in the first subband.

20 [0054] In one embodiment, the subcarrier spacing of subcarriers included in the first subband is used for the UE to determine Y.

[0055] In one embodiment, the subcarrier spacing of subcarriers included in the first subband is used for the UE to determine Y based on a given mapping relationship.

25 [0056] In one embodiment, the feature ID of the monitor of the first signaling is used for the UE to determine the X time intervals in the Y time intervals.

[0057] In one embodiment, the feature ID of the monitor of the first signaling is used for the UE to determine the X time intervals in the Y time intervals based on a given mapping relationship.

- [0058] In one embodiment, the feature ID refers to an International Mobile Subscriber Identification Number (IMSI).
- [0059] In one embodiment, the feature ID refers to a remainder when the IMSI is divided by 1024.
- 5 [0060] In one embodiment, the feature ID refers to a remainder when the IMSI is divided by 4096.
- [0061] In one embodiment, the feature ID refers to a remainder when the IMSI is divided by 16384.
- 10 [0062] In one embodiment, the feature ID refers to a Cell Radio Network Temporary Identity (C-RNTI).
- [0063] In one embodiment, a physical cell ID of a cell transmitting the first signaling is used for determining the X time intervals in the Y time intervals.
- [0064] According to one aspect of the present disclosure, the above method is characterized in that the first time window belongs to one of Z time windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; Any two of the
- 15 Z time windows have an equal time length; The feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.
- [0065] In one embodiment, Z is equal to 10.
- [0066] In one embodiment, any two of the Z time windows are orthogonal in time
- 20 domain.
- [0067] In one embodiment, any one of the Z time windows is a subframe, Z is equal to 10,
- [0068] In one embodiment, any one of the Z time windows is a radio frame, Z is equal to the number of radio frames included in a Discontinuous Reception (DRX)
- 25 cycle.
- [0069] In one embodiment, the above method further includes the following:
- [0070] receiving a third signaling.
- [0071] Herein, the third signaling is used for configuring Z.
- [0072] In one embodiment, the feature ID of the monitor of the first signaling is

used for the UE to determine the first time window in the Z time windows.

[0073] In one embodiment, the feature ID of the monitor of the first signaling is used for the UE to determine the first time window in the Z time windows based on a given mapping relationship.

5 [0074] In one embodiment, any one of the Z time windows is a radio frame; The first time window is obtained by the following formula.

[0075] $\text{SFN mod } Z = (Z \text{ div } N) * (\text{UE_ID mod } N)$

[0076] Herein, SFN is a frame number of a radio frame corresponding to the first time window, $N = \min(Z, nB)$, nB is equal to one of $\{4Z, 2Z, Z, Z/2, Z/4, Z/8, Z/16, Z/32, Z/64, Z/128, Z/256, Z/512, Z/1024\}$.

[0077] According to one aspect of the present disclosure, the above method further includes the following:

[0078] receiving a second radio signal;

15 [0079] Herein, the second radio signal is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

[0080] In one embodiment, the second radio signal includes a Primary Synchronization Signal (PSS).

20 [0081] In one embodiment, the second radio signal includes a Second Synchronization Signal (SSS).

[0082] In one embodiment, the second radio signal is transmitted through a Broadcast Channel (BCH).

[0083] In one embodiment, the second radio signal is transmitted through a Physical Broadcast Channel (PBCH).

25 [0084] In one embodiment, the second radio signal is transmitted through a PDSCH.

[0085] In one embodiment, the second radio signal carries Master Information Block (MIB) information.

[0086] In one embodiment, the second radio signal carries System Information

Block (SIB) information.

[0087] In one embodiment, the information carried by the second radio signal is transmitted cyclically.

5 [0088] In one embodiment, the information carried by the second radio signal is transmitted on-demand.

[0089] In one embodiment, the second radio signal carries first information; The first information is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

10 [0090] In one embodiment, the second radio signal carries first information; The first information indicates at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

[0091] In one embodiment, the second radio signal is used for the UE to determine at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

15 [0092] In one embodiment, the second radio signal indicates at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

[0093] According to one aspect of the present disclosure, the above method further includes the following:

20 [0094] receiving a second signaling;

[0095] Herein, the second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first
25 subband in the Q subbands.

[0096] In one embodiment, in any one of the Q subbands, all the included subcarriers have an equal subcarrier spacing.

[0097] In one embodiment, in any two of the Q subbands, the subcarriers have different subcarrier spacings.

30 [0098] In one embodiment, in two of the Q subbands, the subcarriers have an equal

subcarrier spacing .

[0099] In one embodiment, any two of the Q subbands have an equal frequency domain width.

5 [0100] In one embodiment, two of the Q subbands have different frequency domain widths.

[0101] In one embodiment, the Q subbands all belong to one same carrier.

[0102] In one embodiment, two of the Q subbands belong to different carriers.

[0103] In one embodiment, the second signaling is a high layer signaling.

[0104] In one embodiment, the second signaling is a physical layer signaling.

10 [0105] In one embodiment, the second signaling is transmitted through a BCH.

[0106] In one embodiment, the second signaling is transmitted through a PBCH.

[0107] In one embodiment, the second signaling is transmitted through a PDSCH.

[0108] In one embodiment, the second signaling is a Radio Resource Control (RRC) signaling.

15 [0109] In one embodiment, the second signaling is an SIB.

[0110] In one embodiment, the second signaling is transmitted through a DCI.

[0111] In one embodiment, the feature ID of the monitor of the first signaling is used for the UE to determine the first subband in the Q subbands.

20 [0112] In one embodiment, the feature ID of the monitor of the first signaling is used for the UE to determine the first subband in the Q subbands based on a specific mapping relationship.

[0113] The present disclosure discloses a method in a base station used for paging. The method includes the following:

25 [0114] transmitting a first signaling in a positive integer number of time intervals of X time intervals; and

[0115] transmitting a first radio signal.

[0116] Herein, X is a positive integer; The first signaling is used for determining scheduling information for the first radio signal; The scheduling information includes

at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer
5 number of consecutive subcarriers in frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

[00117] According to one aspect of the present disclosure, the above method is characterized in that any one of the X time intervals belongs to a first time window in
10 time domain; The time length of the first time window is predefined; The first time window is divided into Y time intervals; The X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; The subcarrier spacing of subcarriers included in the first subband is used for determining Y; A feature ID of a monitor of the first signaling is used for determining the X time
15 intervals in the Y time intervals.

[00118] According to one aspect of the present disclosure, the above method is characterized in that the first time window belongs to one of Z time windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; Any two of the Z time windows have an equal time length; The feature ID of the monitor of the first
20 signaling is used for determining the first time window in the Z time windows.

[00119] According to one aspect of the present disclosure, the above method further includes the following:

[00120] transmitting a second radio signal;

[00121] Herein, the second radio signal is used for determining at least one of
25 {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

[00122] According to one aspect of the present disclosure, the above method further includes the following:

[00123] transmitting a second signaling;

30 [00124] Herein, the second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the

Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands.

[00125] The present disclosure discloses a UE used for paging. The UE includes:

5 [00126] a first receiver module, to monitor a first signaling in X time intervals; and

[00127] a second receiver module, to receive a first radio signal.

[00128] Herein, X is a positive integer. The first signaling is used for determining scheduling information for the first radio signal; The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer number of consecutive subcarriers in frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

[00129] According to one aspect of the present disclosure, the above UE is characterized in that any one of the X time intervals belongs to a first time window in time domain; The time length of the first time window is predefined; The first time window is divided into Y time intervals; The X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; The subcarrier spacing of subcarriers included in the first subband is used for determining Y; A feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals.

[00130] According to one aspect of the present disclosure, the above UE is characterized in that the first time window belongs to one of Z time windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; Any two of the Z time windows have an equal time length; The feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.

[00131] According to one aspect of the present disclosure, the above UE is characterized in that the first receiver module further receives a second radio signal; The second radio signal is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first

subband}.

[00132] According to one aspect of the present disclosure, the above UE is characterized in that the first receiver module further receives a second signaling; The second signaling is used for determining Q subbands, Q being a positive integer;
5 The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands.

10 [00133] The present disclosure discloses a base station device used for paging. The base station device includes:

[00134] a first transmitter module, to transmit a first signaling in a positive integer number of time intervals of X time intervals respectively; and

[00135] a second transmitter module, to transmit a first radio signal;

15 [00136] Herein, X is a positive integer; The first signaling is used for determining scheduling information for the first radio signal; The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer
20 number of consecutive subcarriers in frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

25 [00137] According to one aspect of the present disclosure, the above base station device is characterized in that any one of the X time intervals belongs to a first time window in time domain; The time length of the first time window is predefined; The first time window is divided into Y time intervals; The X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; The subcarrier spacing of subcarriers included in the first subband is used for determining Y; A feature ID of a monitor of the first signaling is used for determining the X time
30 intervals in the Y time intervals.

[00138] According to one aspect of the present disclosure, the above base station device is characterized in that the first time window belongs to one of Z time

windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; Any two of the Z time windows have an equal time length; The feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.

- 5 [00139] According to one aspect of the present disclosure, the above base station device is characterized in that the first transmitter module further transmits a second radio signal; The second radio signal is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.
- 10 [00140] According to one aspect of the present disclosure, the above base station device is characterized in that the first transmitter module further transmits a second signaling; The second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The
- 15 feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands.

BRIEF DESCRIPTION OF THE DRAWINGS

- 20 [00141] Other features, purposes and advantages of the present disclosure will become more apparent from the detailed description of non-restrictive embodiments taken in conjunction with the following drawings.
- [00142] FIG 1 is a flowchart illustrating the transmission of a first signaling and a first radio signal according to one embodiment of the present disclosure.
- 25 [00143] FIG 2 is a diagram illustrating a network architecture according to one embodiment of the present disclosure.
- [00144] FIG 3 is a diagram illustrating a radio protocol architecture of a user plane and a control plane according to one embodiment of the present disclosure.
- [00145] FIG 4 is a diagram illustrating a base station device and a UE according to one embodiment of the present disclosure.
- 30 [00146] FIG 5 is a flowchart illustrating the transmission of a radio signal according

to one embodiment of the present disclosure.

[00147] FIG 6 is a diagram illustrating a relationship between Z time windows and Q subbands according to one embodiment of the present disclosure.

5 [00148] FIG 7 is a diagram illustrating a relationship between a first time window and X time intervals according to one embodiment of the present disclosure.

[00149] FIG 8 is a diagram illustrating a relationship among a first signaling, a first radio signal and a second radio signal according to one embodiment of the present disclosure.

10 [00150] FIG 9 is a structure block diagram illustrating a processing device in a UE according to one embodiment of the present disclosure.

[00151] FIG 10 is a structure block diagram illustrating a processing device in a base station according to one embodiment of the present disclosure.

DESCRIPTION OF THE EMBODIMENTS

15 [00152] The technical scheme of the present disclosure is described below in further detail in conjunction with the drawings. It should be noted that the embodiments in the disclosure and the characteristics of the embodiments may be arbitrarily combined if there is no conflict.

[00153] Embodiment 1

20 [00154] Embodiment 1 illustrates an example of a flowchart for the transmission of a first signaling and a first radio signal according to one embodiment of the present disclosure, as shown in FIG. 1. In FIG. 1, each box represents a step. In Embodiment 1, the UE of the present disclosure first monitors a first signaling in X time intervals, and then receives a first radio signal, wherein X is a positive integer; The first signaling is used for determining scheduling information for the first radio signal;
25 The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer number of consecutive subcarriers in
30 frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for

determining the X time intervals.

5 [00155] In one embodiment, any one of the X time intervals belongs to a first time window in time domain; The time length of the first time window is predefined; The first time window is divided into Y time intervals; The X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; The subcarrier spacing of subcarriers included in the first subband is used for determining Y; A feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals.

10 [00156] In one embodiment, any one of the X time intervals belongs to a first time window in time domain; The time length of the first time window is predefined; The first time window is divided into Y time intervals; The X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; The subcarrier spacing of subcarriers included in the first subband is used for determining Y; A feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals; The first time window belongs to one of Z time windows, Z being an integer greater than 1. Z is predefined, or Z is configurable; Any two of the Z time windows have an equal time length; The feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.

20 [00157] In one embodiment, the method further includes the following:

[00158] receiving a second radio signal;

[00159] Herein, the second radio signal is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

25 [00160] In one embodiment, the method further includes the following:

[00161] receiving a second signaling;

30 [00162] The second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands.

[00163] Embodiment 2

[00164] Embodiment 2 illustrates an example of a diagram for a network architecture, as shown in FIG 2. FIG 2 is a diagram illustrating a system network architecture 200 of NR 5G, LTE and Long-Term Evolution Advanced (LTE-A). The NR 5G or LTE network architecture 200 may be called an Evolved Packet System (EPS) 200. The EPS 200 may include one or more UEs 201, a Next Generation-Radio Access Network (NG-RAN) 202, an Evolved Packet Core /5G-Core Network (EPC/5G-CN) 210, a Home Subscriber Server (HSS) 220 and an Internet Service 230. The EPS may be interconnected with other access networks. For simple description, the entities/interfaces are not shown. As shown in FIG 2, the EPS provides packet switching services. Those skilled in the art are easy to understand that various concepts presented throughout the present disclosure can be extended to networks providing circuit switching services or other cellular networks. The NG-RAN includes an NR node B (gNB) 203 and other gNBs 204. The gNB 203 provides user plane and control plane protocol terminations towards the UE 201. The gNB 203 may be connected to other gNBs 204 via an Xn interface (for example, backhaul). The gNB 203 may be called a base station, a base transceiver station, a radio base station, a radio transceiver, a transceiver function, a Basic Service Set (BSS), an Extended Service Set (ESS), a TRP or other appropriate terms. The gNB 203 provides an access point of the 5G-CN/EPC 210 for the UE 201. Examples of UE 201 include cellular phones, smart phones, Session Initiation Protocol (SIP) phones, laptop computers, Personal Digital Assistants (PDAs), Satellite Radios, Global Positioning Systems (GPSs), multimedia devices, video devices, digital audio player (for example, MP3 players), cameras, games consoles, unmanned aerial vehicles, air vehicles, narrow-band physical network equipment, machine-type communication equipment, land vehicles, automobiles, wearable equipment, or any other devices having similar functions. Those skilled in the art also can call the UE 201 a mobile station, a subscriber station, a mobile unit, a subscriber unit, a wireless unit, a remote unit, a mobile device, a wireless device, a radio communication device, a remote device, a mobile subscriber station, an access terminal, a mobile terminal, a wireless terminal, a remote terminal, a handset, a user agent, a mobile client, a client or other appropriate terms. The gNB 203 is connected to the EPC/5G-CN 210 via an S1/NG interface. The EPC/5G-CN 210 includes a Mobility Management

Entity/Authentication Management Field/User Plane Function (MME/AMF/UPF) 211, other MMEs/AMFs/UPFs 214, a Service Gateway (S-GW) 212 and a Packet Data Network Gateway (P-GW) 213. The MME/AMF/UPF 211 is a control node for processing a signaling between the UE 201 and the 5G-CN/EPC 210. Generally, the MME/AMF/UPF 211 provides bearer and connection management. All user Internet Protocol (IP) packets are transmitted through the S-GW 212. The S-GW 212 is connected to the P-GW 213. The P-GW 213 provides UE IP address allocation and other functions. The P-GW 213 is connected to the internet service 230. The internet service 230 includes IP services corresponding to operators, specifically including internet, intranet, IP Multimedia Subsystems (IP IMSs) and PS Streaming Services (PSSs).

[00165] In one embodiment, the UE 201 corresponds to the UE in the present disclosure.

[00166] In one embodiment, the UE 201 supports the transmission based on multiple numerologies.

[00167] In one embodiment, the gNB 203 corresponds to the base station device in the present disclosure.

[00168] In one embodiment, the gNB 203 supports the transmission based on multiple numerologies.

[00169] Embodiment 3

[00170] Embodiment 3 is a diagram illustrating an embodiment of a radio protocol architecture of a user plane and a control plane according to the present disclosure, as shown in FIG. 3. FIG. 3 is a diagram illustrating an embodiment of a radio protocol architecture of a user plane and a control plane. In FIG. 3, the radio protocol architecture of a UE and a base station device (gNB or eNB) is presented by three layers, which are a layer 1, a layer 2 and a layer 3 respectively. The layer 1 (L1) is the lowest layer and performs signal processing functions of a PHY layer. The layer 1 is called PHY 301 in this paper. The layer 2 (L2) 305 is above the PHY 301, and is in charge of the link between the UE and the gNB via the PHY 301. In the user plane, the L2 305 includes a Medium Access Control (MAC) sublayer 302, a Radio Link Control (RLC) sublayer 303, and a Packet Data Convergence Protocol (PDCP) sublayer 304. All the three sublayers end at the gNB of the network side. Although

not described in FIG.3, the UE may include several higher layers above the L2 305, such as network layer (i.e. IP layer) ending at a P-GW of the network side and an application layer ending at the other side of the connection (i.e. a peer UE, a server, etc.). The PDCP sublayer 304 provides multiplexing among variable radio bearers and logical channels. The PDCP sublayer 304 also provides a header compression for a higher layer packet so as to reduce a radio transmission overhead. The PDCP sublayer 304 provides security by encrypting a packet and provides support for UE handover between gNBs. The RLC sublayer 303 provides segmentation and reassembling of a higher layer packet, retransmission of a lost packet, and reordering of a lost packet to as to compensate the disordered receiving caused by Hybrid Automatic Repeat Request (HARQ). The MAC sublayer 302 provides multiplexing between logical channels and transport channels. The MAC sublayer 302 is also responsible for allocating between UEs various radio resources (i.e., resource block) in a cell. The MAC sublayer 302 is also in charge of HARQ operation. In the control plane, the radio protocol architecture of the UE and the gNB is almost the same as the radio protocol architecture in the user plane on the PHY 301 and the L2 305, but there is no header compression for the control plane. The control plane also includes a Radio Resource Control (RRC) sublayer 306 in the layer 3 (L3). The RRC sublayer 306 is responsible for acquiring radio resources (i.e. radio bearer) and configuring the lower layers using an RRC signaling between the gNB and the UE.

[00171] In one embodiment, the radio protocol architecture shown in FIG. 3 is applicable to the UE in the present disclosure.

[00172] In one embodiment, the radio protocol architecture shown in FIG. 3 is applicable to the base station device in the present disclosure.

[00173] In one embodiment, the first signaling in the present disclosure is generated by the PHY 301.

[00174] In one embodiment, the first signaling in the present disclosure is generated by the MAC 302.

[00175] In one embodiment, the first signaling in the present disclosure is generated by the RRC 306.

[00176] In one embodiment, the second signaling in the present disclosure is generated by the PHY 301.

- [00177] In one embodiment, the second signaling in the present disclosure is generated by the MAC 302.
- [00178] In one embodiment, the second signaling in the present disclosure is generated by the RRC 306.
- 5 [00179] In one embodiment, the first radio signal in the present disclosure is generated by the RRC 306.
- [00180] In one embodiment, the first radio signal in the present disclosure is generated by the MAC 302.
- 10 [00181] In one embodiment, the first radio signal in the present disclosure is generated by the PHY 301.
- [00182] In one embodiment, the second radio signal in the present disclosure is generated by the RRC 306.
- [00183] In one embodiment, the second radio signal in the present disclosure is generated by the MAC 302.
- 15 [00184] In one embodiment, the second radio signal in the present disclosure is generated by the PHY 301.
- [00185] Embodiment 4
- [00186] Embodiment 4 illustrates a diagram of a base station device and a given UE according to the present disclosure, as shown in FIG. 4. FIG. 4 is a block diagram of
- 20 a gNB 410 in communication with a UE 450 in an access network.
- [00187] The base station device 410 includes a controller/processor 440, a memory 430, a receiving processor 412, a transmitter/receiver 416 and a transmitting processor 415. The transmitter/receiver 416 includes an antenna 420. A packet from a higher layer is provided to the controller/processor 440. The controller/processor
- 25 440 provides header compression/decompression, encryption/decryption, packet segmentation and reordering, multiplexing/de-multiplexing between a logical channel and a transport channel, to implement the L2 protocol used for the user plane and the control plane. The packet from a higher layer may include data or control information, for example, DL-SCH or UL-SCH. The transmitting processor 455
- 30 performs signal transmitting processing functions of an L1 layer (that is, PHY), including encoding, interleaving, scrambling, modulation, power control/allocation,

precoding, generation of physical layer control signaling (including PBCH, PDCCH, PHICH, PCFICH, reference signal), etc. The receiving processor 412 performs signal receiving processing functions of the L1 layer (that is, PHY), including decoding, de-interleaving, descrambling, demodulation, decoding, extraction of physical layer control signaling, etc. The transmitter 416 is configured to convert a baseband signal provided by the transmitting processor 415 into a radio-frequency signal and transmit the radio-frequency signal via the antenna 420. The receiver 416 is configured to convert a radio-frequency signal received via the antenna 420 into a baseband signal and provide the baseband signal to the receiving processor 412.

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10 [00188] The UE 450 includes a controller/processor 490, a memory 480, a receiving processor 452, a transmitter/receiver 456, a transmitting processor 455, and a data source 467. The transmitter/receiver 456 includes an antenna 460. The data source 467 provides a packet from a higher layer packet to the controller/processor 490. The controller/processor 490 provides header compression/decompression,

15 encryption/decryption, packet segmentation and reordering, multiplexing/de-multiplexing between a logical channel and a transport channel, to implement the L2 protocol used for the user plane and the control plane. The packet from a higher layer may include data or control information, for example, DL-SCH or UL-SCH. The transmitting processor 490 performs signal transmitting processing

20 functions of an L1 layer (that is, PHY), including encoding, interleaving, scrambling, modulation, power control/allocation, precoding, generation of physical layer control signaling, etc. The receiving processor 452 performs signal receiving processing functions of the L1 layer (that is, PHY), including decoding, de-interleaving, descrambling, demodulation, decoding, extraction of physical layer control signaling,

25 etc. The transmitter 456 is configured to convert a baseband signal provided by the transmitting processor 455 into a radio-frequency signal and transmit the radio-frequency signal via the antenna 460. The receiver 456 is configured to convert a radio-frequency signal received via the antenna 460 into a baseband signal and provide the baseband signal to the receiving processor 452.

30 [00189] In Downlink (DL) transmission, a packet DL-SCH from a higher layer, which includes the first radio signal, the second radio signal and the second signaling in the present disclosure, is provided to the controller/processor 440. The controller/processor 440 performs functions of a layer 2. In downlink transmission,

the controller/processor 440 provides header compression, encryption, packet segmentation and reordering, multiplexing between a logical channel and a transport channel, and radio resource allocation for the UE 450 based on various priorities. The controller/processor 440 is also in charge of HARQ operation, retransmission of a lost packet, and a signaling to the UE450. The transmitting processor 415 performs signal processing functions of the layer 1, including the generation of the first signaling in the present disclosure. The generation of the second signaling and the generation of the physical layer signals of the first radio signal and second radio signal are accomplished at the transmitting processor 415. The signal processing function includes decoding and interleaving, so as to ensure an FEC (Forward Error Correction) and a demodulation corresponding to a modulation scheme (i.e., BPSK, QPSK, etc.) at the UE 450 side. The modulated signals are divided into parallel streams. Each of the parallel streams is mapped into a corresponding subcarrier of multi-carriers and/or multi-carrier symbol. Then the transmitting processor 415 maps the parallel stream into the antenna 420 via the transmitter 416 to as to transmit the parallel stream in the form of Radio Frequency (RF) signals. At the receiving side, every receiver 456 receives a radio frequency signal via the corresponding antenna 460. Every receiver 456 recovers the baseband information modulated to the RF carrier and provides the baseband information to the receiving processor 452. The receiving processor 452 performs signal receiving processing functions of the layer 1, including the detection of the first signaling in the present disclosure, the receiving of the first radio signal and the second radio signal, the receiving of the physical layer signal of the second signaling, etc. Demodulation is conducted corresponding to a modulation scheme (i.e., BPSK, QPSK, etc.) through the multi-carrier symbol in the multi-carrier symbol stream, then decoding and de-interleaving are conducted to recover the data or control signal transmitted by the gNB 410 on the physical channel, and then the data and control signal are provided to the controller/processor 490. The controller/processor 490 performs functions of the layer 2. The controller/processor can be connected to a memory 480 that stores program code and data. The memory 480 is a computer readable media.

[00190] In one embodiment, the UE 450 corresponds to the UE in the present disclosure.

[00191] In one embodiment, the gNB 410 corresponds to the base station device in

the present disclosure.

5 [00192] In one embodiment, the UE 450 device includes at least one processor and at least one memory. The at least one memory includes computer program codes. The at least one memory and the computer program codes are configured to be used in collaboration with the at least one processor. The UE 450 device at least monitors a first signaling in X time intervals and receives a first radio signal, wherein X is a positive integer; The first signaling is used for determining scheduling information for the first radio signal; The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer number of consecutive subcarriers in frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

10 [00193] In one embodiment, the UE 450 includes a memory that stores a computer readable instruction program. The computer readable instruction program generates an action when executed by at least one processor. The action includes monitoring a first signaling in X time intervals and receiving a first radio signal, wherein X is a positive integer; The first signaling is used for determining scheduling information for the first radio signal; The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer number of consecutive subcarriers in frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

15 [00194] In one embodiment, the gNB 410 device includes at least one processor and at least one memory. The at least one memory includes computer program codes. The at least one memory and the computer program codes are configured to be used in collaboration with the at least one processor. The gNB 410 at least transmits a first signaling in a positive integer number of time intervals of X time intervals and

transmits a first radio signal, wherein X is a positive integer; The first signaling is used for determining scheduling information for the first radio signal; The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer number of consecutive subcarriers in frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

[00195] In one embodiment, the gNB 410 device includes a memory that stores a computer readable instruction program. The computer readable instruction program generates an action when executed by at least one processor. The action includes transmitting a first signaling in a positive integer number of time intervals of X time intervals and transmitting a first radio signal, wherein X is a positive integer; The first signaling is used for determining scheduling information for the first radio signal; The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer number of consecutive subcarriers in frequency domain. At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

[00196] In one embodiment, the receiver 456 (including the antenna 460) and the receiving processor 452 are configured to monitor the first signaling in the present disclosure.

[00197] In one embodiment, the receiver 456 (including the antenna 460), the receiving processor 452 and the controller/processor 490 are configured to receive the first radio signal in the present disclosure.

[00198] In one embodiment, the receiver 456 (including the antenna 460), the receiving processor 452 and the controller/processor 490 are configured to receive

the second radio signal in the present disclosure.

[00199] In one embodiment, the receiver 456 (including the antenna 460), the receiving processor 452 and the controller/processor 490 are configured to monitor the second signaling in the present disclosure.

5 [00200] In one embodiment, the transmitter 416 (including the antenna 420) and the transmitting processor 415 are configured to transmit the first signaling in the present disclosure.

10 [00201] In one embodiment, the transmitter 416 (including the antenna 420), the transmitting processor 415 and the controller/processor 440 are configured to transmit the first radio signal in the present disclosure.

[00202] In one embodiment, the transmitter 416 (including the antenna 420), the transmitting processor 415 and the controller/processor 440 are configured to transmit the second radio signal in the present disclosure.

15 [00203] In one embodiment, the transmitter 416 (including the antenna 420), the transmitting processor 415 and the controller/processor 440 are configured to transmit the second signaling in the present disclosure.

[00204] Embodiment 5

20 [00205] Embodiment 5 illustrates an example of a flowchart for the transmission of a radio signal according to an embodiment of the present disclosure, as shown in FIG 5. In FIG 5, the base station N1 is a maintenance base station for a serving cell of the UE U2. Steps marked in a dotted box are optional.

[00206] The base station N1 transmits a second radio signal in S11, transmits a second signaling in S12, transmits a first signaling in a positive integer number of time intervals of X time intervals in S13, and transmits a first radio signal in S14.

25 [00207] The UE U2 receives the second radio signal in S21, receives the second signaling in S22, monitors the first signaling in X time intervals in S23, and receives the first radio signal in S24.

30 [00208] In Embodiment 5, X is a positive integer; The first signaling is used for determining scheduling information for the first radio signal; The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The

first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer number of consecutive subcarriers in frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals; The second radio signal is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}; The second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; A feature ID of a monitor of the first signaling is used for determining the first subband in the Q subbands.

[00209] In one embodiment, any one of the X time intervals belongs to a first time window in time domain; The time length of the first time window is predefined; The first time window is divided into Y time intervals; The X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; The subcarrier spacing of subcarriers included in the first subband is used for determining Y; The feature ID of the monitor of the first signaling is used for determining the X time intervals in the Y time intervals.

[00210] In one embodiment, the first time window belongs to one of Z time windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; Any two of the Z time windows have an equal time length; The feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.

[00211] In one embodiment, the paging message includes a feature ID of a paged UE.

[00212] In one embodiment, the MCS includes one of {QPSK, 16QAM, 64QAM, 256QAM, 1024QAM}.

[00213] In one embodiment, the subcarrier spacing is equal to 15kHz multiplied by 2 to the Kth power. K is an integer.

[00214] In one embodiment, the first subband includes a positive integer multiple of 12 subcarriers.

- [00215] In one embodiment, all subcarriers included in the first subband have an equal subcarrier spacing.
- 5 [00216] In one embodiment, the location of the first subband in frequency domain refers to the location of the first subband in a carrier where the first subband is located.
- [00217] In one embodiment, the location of the first subband in frequency domain refers to the location of a carrier where the first subband is located in frequency domain.
- 10 [00218] In one embodiment, the location of the first subband in frequency domain refers to a subband index of the first subband in a carrier where the first subband is located.
- [00219] In one embodiment, the location of the first subband in frequency domain refers to the location of the first subband in a frequency resource corresponding to a band where the first subband is located.
- 15 [00220] In one embodiment, the second signaling is a high layer signaling.
- [00221] In one embodiment, the second signaling is a physical layer signaling.
- [00222] In one embodiment, the second signaling is transmitted through a BCH.
- [00223] In one embodiment, the second signaling is transmitted through a PBCH.
- [00224] In one embodiment, the second signaling is transmitted through a PDSCH.
- 20 [00225] In one embodiment, the second signaling is an RRC signaling.
- [00226] In one embodiment, the second signaling is an SIB.
- [00227] In one embodiment, the second signaling is transmitted through a DCI.
- [00228] Embodiment 6
- 25 [00229] Embodiment 6 illustrates an example of a diagram for a relationship between Z time windows and Q subbands according to one embodiment of the present disclosure, as shown in FIG 6. In FIG 6, the horizontal axis represents time, the vertical axis represents frequency, each rectangle represents a time interval, the rectangles filled by oblique lines represent X1 time intervals monitored by a UE#1 in a time window #a, the rectangles filled by cross lines represent X2 time intervals

monitored by a UE#2 in a time window #b, the rectangles filled by crossed oblique lines represent X3 time intervals monitored by a UE#3 in a time window #c.

5 [00230] In embodiment 6, the UE#1 monitors a first signaling in X1 time intervals respectively. The frequency domain resource used for transmitting the first signaling belongs to the subband #1. The subband #1 includes a positive integer number of consecutive subcarriers in frequency domain. At least one of {location of the subband #1 in frequency domain, subcarrier spacing of subcarriers included in the subband #1} is used for determining the X1 time intervals. Any one of the X1 time intervals belongs to the time window #a in time domain. The time length of the time window #a is predefined. The time window #a is divided into Y1 time intervals. The X1 time intervals are X1 time intervals of the Y1 time intervals, Y1 being a positive integer not smaller than X1. The subcarrier spacing of subcarriers included in the subband #1 is used for determining Y1. A feature ID of the UE#1 is used for determining the X1 time intervals in the Y1 time intervals. The time window #a belongs to one of Z time windows, Z being an integer greater than 1. Z is predefined, or Z is configurable. Any two of the Z time windows have an equal time length. The feature ID of the UE#1 is used for determining the time window #a in the Z time windows. The subband #1 belongs to one of the Q subbands, Q being a positive integer. Any one of the Q subbands includes a positive integer number of consecutive subcarriers. The feature ID of the UE#1 is used for determining the subband #1 in the Q subbands.

[00231] In one embodiment, Z is equal to 10.

[00232] In one embodiment, any two of the Z time windows are orthogonal in time domain.

25 [00233] In one embodiment, any one of the Z time windows is a subframe. Z is equal to 10,

[00234] In one embodiment, any one of the Z time windows is a radio frame. Z is equal to the number of radio frames included in a DRX cycle.

30 [00235] In one embodiment, any one of the Z time windows is a radio frame. The time window #a is obtained by the following formula.

[00236] $SFN \bmod Z = (Z \div N) * (UE_ID \bmod N)$

- [00237] Herein, SFN is a frame number of a radio frame corresponding to the time window #a, $N = \min(Z, nB)$, nB is equal to one of $\{4Z, 2Z, Z, Z/2, Z/4, Z/8, Z/16, Z/32, Z/64, Z/128, Z/256, Z/512, Z/1024\}$.
- 5 [00238] In one embodiment, in any one of the Q subbands, all the included subcarriers have an equal subcarrier spacing.
- [00239] In one embodiment, in any two of the Q subbands, the subcarriers have different subcarrier spacings.
- [00240] In one embodiment, in two of the Q subbands, the subcarriers have an equal subcarrier spacing .
- 10 [00241] In one embodiment, any two of the Q subbands have an equal frequency domain width.
- [00242] In one embodiment, two of the Q subbands have different frequency domain widths.
- [00243] In one embodiment, the Q subbands all belong to one same carrier.
- 15 [00244] In one embodiment, two of the Q subbands belong to different carriers.
- [00245] Embodiment 7
- [00246] Embodiment 7 illustrates an example of a diagram for a relationship between a first time window and X time intervals according to one embodiment of the present disclosure, as shown in FIG. 7. FIG. 7 lists the index of X=1 time interval
- 20 in the first time window according to different Y values and different UE feature IDs.
- [00247] In embodiment 7, the UE monitors a first signaling in X time intervals respectively. Any one of the X time intervals belongs to a first time window in time domain. The time length of the first time window is predefined. The first time window is divided into Y time intervals. The X time intervals are X time intervals of
- 25 the Y time intervals, Y being a positive integer not smaller than X. The subcarrier spacing of subcarriers included in the first subband is used for determining Y. The feature ID of the UE is used for determining the X time intervals in the Y time intervals.
- [00248] In one embodiment, the first signaling is detected P times at most in each
- 30 one of the X time intervals. P is a positive integer.

- [00249] In one embodiment, any two of the X time intervals have an equal time length.
- [00250] In one embodiment, two of the X time times have different time lengths.
- [00251] In one embodiment, any one of the X time intervals is a slot.
- 5 [00252] In one embodiment, any two of the X time intervals have an equal time length, and the time length of each one of the X time intervals is correlated to the subcarrier spacing of subcarriers included in the first subband.
- [00253] In one embodiment, any one of the X time intervals is M OFDM symbols. M is a positive integer smaller than 14.
- 10 [00254] In one embodiment, any one of the X time intervals is M OFDM symbols. M is a positive integer smaller than 7.
- [00255] In one embodiment, any two of the X time intervals are orthogonal in time domain. The orthogonality refers that there is no time unit that belongs to any two of the X time intervals simultaneously.
- 15 [00256] In one embodiment, two of the X time intervals are discrete in time domain.
- [00257] In one embodiment, the time length of the first time window is fixed.
- [00258] In one embodiment, the first time window includes a positive integer number of consecutive multi-carrier symbols.
- [00259] In one embodiment, the multi-carrier symbol includes a data symbol and a
- 20 CP.
- [00260] In one embodiment, the first time window has a time length of 1 millisecond.
- [00261] In one embodiment, the first time window has a time length of 10 milliseconds.
- 25 [00262] In one embodiment, the first time window is a subframe.
- [00263] In one embodiment, the first time window is a radio frame.
- [00264] In one embodiment, any two of the Y time intervals have an equal time length.
- [00265] In one embodiment, Y is proportional to the subcarrier spacing of

subcarriers included in the first subband.

[00266] In one embodiment, the feature ID refers to an IMSI.

[00267] In one embodiment, the feature ID refers to a remainder when the IMSI is divided by 1024.

5 [00268] In one embodiment, the feature ID refers to a remainder when the IMSI is divided by 4096.

[00269] In one embodiment, the feature ID refers to a remainder when the IMSI is divided by 16384.

[00270] In one embodiment, the feature ID refers to a C-RNTI.

10 [00271] Embodiment 8

[00272] Embodiment 8 illustrates an example of a diagram for a relationship among a first signaling, a first radio signal and a second radio signal according to one embodiment of the present disclosure, as shown in FIG. 8. In FIG. 8, the horizontal axis represents time, the vertical axis represents frequency, the rectangle filled by oblique lines represents a time-frequency resource occupied by the second radio
15 signal, the rectangle filled by cross lines represents a time-frequency resource occupied by the first signaling, the rectangle filled by crossed oblique lines represents a time-frequency resource occupied by the first radio signal, and the dotted arrow represents a specific usage relationship.

20 [00273] In embodiment 8, the first signaling is used for determining scheduling information for the first radio signal. The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}. The frequency domain resource used for transmitting the first signaling belongs to a first subband. The first subband
25 includes a positive integer number of consecutive subcarriers in frequency domain. The second radio signal is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

[00274] In one embodiment, the first signaling is a physical layer signaling.

30 [00275] In one embodiment, the first signaling is DCI.

- [00276] In one embodiment, the first signaling is transmitted through an NR-PDCCH.
- [00277] In one embodiment, the first signaling is transmitted through a PDCCH. The PDCCH has a CRC scrambled by a P-RNTI.
- 5 [00278] In one embodiment, the first radio signal is transmitted through a DL-SCH.
- [00279] In one embodiment, the first radio signal is transmitted through a PDSCH.
- [00280] In one embodiment, a first bit block is subjected to a modulation mapper, a layer mapper, precoding, a resource element mapper and OFDM single generation in sequence to obtain the first radio signal. The first bit block includes the output
- 10 obtained after a code block is subjected to channel coding. In one subembodiment, the code block is a TB. In one subembodiment, the code block is one part of a TB.
- [00281] In one embodiment, the second radio signal includes a PSS.
- [00282] In one embodiment, the second radio signal includes an SSS.
- [00283] In one embodiment, the second radio signal is transmitted through a BCH.
- 15 [00284] In one embodiment, the second radio signal is transmitted through a PBCH.
- [00285] In one embodiment, the second radio signal carries MIB information.
- [00286] In one embodiment, the second radio signal carries SIB information.
- [00287] In one embodiment, the information carried by the second radio signal is transmitted cyclically.
- 20 [00288] In one embodiment, the information carried by the second radio signal is transmitted on-demand.
- [00289] In one embodiment, the second radio signal carries first information. The first information is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.
- 25 [00290] In one embodiment, the second radio signal carries first information. The first information indicates at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.
- [00291] Embodiment 9
- [00292] Embodiment 9 illustrates an example of a structure block diagram for a

processing device in a UE, as shown in FIG. 9. In FIG. 9, the processing device 900 for the UE is mainly composed of a first receiver module 901 and a second receiver module 902. The first receiver module 901 includes the transmitter/receiver 456 (including the antenna 460), the receiving processor 452 and the controller/processor 490 shown in FIG. 4. The second receiver module 902 includes the transmitter/receiver 456 (including the antenna 460), the receiving processor 452 and the controller/processor 490 shown in FIG. 4.

[00293] In embodiment 9, the first receiver module 901 monitors a first signaling in X time intervals, and the second receiver module 902 receives a first radio signal, wherein X is a positive integer; The first signaling is used for determining scheduling information for the first radio signal; The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer number of consecutive subcarriers in frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

[00294] In one embodiment, any one of the X time intervals belongs to a first time window in time domain; The time length of the first time window is predefined; The first time window is divided into Y time intervals; The X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; The subcarrier spacing of subcarriers included in the first subband is used for determining Y; A feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals.

[00295] In one embodiment, the first time window belongs to one of Z time windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; Any two of the Z time windows have an equal time length; The feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.

[00296] In one embodiment, the first receiver module 901 further receives a second radio signal; The second radio signal is used for determining at least one of {location

of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

5 [00297] In one embodiment, the first receiver module 901 further receives a second signaling; The second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands.

[00298] Embodiment 10

10 [00299] Embodiment 10 illustrates an example of a structure block diagram for a processing device in a base station, as shown in FIG 10. The processing device 1000 for the base station is mainly composed of a first transmitter module 1001 and a second transmitter module 1002. The first transmitter module 1001 includes the transmitter/receiver 416 (including the antenna 420), the transmitting processor 415
15 and the controller/processor 440 shown in FIG 4. The second transmitter module 1002 is mainly composed of the transmitter/receiver 416 (including the antenna 420), the transmitting processor 415 and the controller/processor 440 shown in FIG 4.

[00300] In embodiment 10, the first transmitter module 1001 transmits a first signaling in a positive integer number of time intervals of X time intervals, and the
20 second transmitter module 1002 transmits a first radio signal, wherein X is a positive integer; The first signaling is used for determining scheduling information for the first radio signal; The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; The first radio signal carries a paging message; The
25 frequency domain resource used for transmitting the first signaling belongs to a first subband; The first subband includes a positive integer number of consecutive subcarriers in frequency domain; At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

30 [00301] In one embodiment, any one of the X time intervals belongs to a first time window in time domain; The time length of the first time window is predefined; The first time window is divided into Y time intervals; The X time intervals are X time

intervals of the Y time intervals, Y being a positive integer not smaller than X; The subcarrier spacing of subcarriers included in the first subband is used for determining Y; A feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals.

- 5 **[00302]** In one embodiment, the first time window belongs to one of Z time windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; Any two of the Z time windows have an equal time length; The feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.
- 10 **[00303]** In one embodiment, the first transmitter module 1001 further transmits a second radio signal; The second radio signal is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.
- 15 **[00304]** In one embodiment, the first transmitter module 1001 further transmits a second signaling; The second signaling is used for determining Q subbands, Q being a positive integer; The first subband belongs to one of the Q subbands; Any one of the Q subbands includes a positive integer number of consecutive subcarriers; The feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands.
- 20 **[00305]** The ordinary skill in the art may understand that all or part steps in the above method may be implemented by instructing related hardware through a program. The program may be stored in a computer readable storage medium, for example Read-Only Memory (ROM), hard disk or compact disc, etc. Optionally, all or part steps in the above embodiments also may be implemented by one or more
- 25 integrated circuits. Correspondingly, each module unit in the above embodiment may be realized in the form of hardware, or in the form of software function modules. The present disclosure is not limited to any combination of hardware and software in specific forms. The UE and terminal in the present disclosure include but not limited to mobile phones, tablet computers, notebooks, network cards, low-power
- 30 equipment, eMTC equipment, NB-IoT equipment, unmanned aerial vehicles, telecontrolled aircrafts, vehicle-mounted communication equipment and other wireless communication equipment. The base station in the present disclosure

includes but not limited to macro-cellular base stations, micro-cellular base stations, home base stations, relay base station, eNB, gNB, TRP and other radio communication equipment.

- 5 **[00306]** The above are merely the preferred embodiments of the present disclosure and are not intended to limit the scope of protection of the present disclosure. Any modification, equivalent substitute and improvement made within the spirit and principle of the present disclosure are intended to be included within the scope of protection of the present disclosure.

Claims

WHAT IS CLAIMED IS:

1. A method in a User Equipment (UE) for paging, comprising:

monitoring a first signaling in X time intervals; and
receiving a first radio signal;

wherein X is a positive integer; the first signaling is used for determining scheduling information for the first radio signal; the scheduling information comprises at least one of {occupied time-frequency resource, adopted Modulation Coding Scheme (MCS), subcarrier spacing of subcarriers in occupied frequency domain resource}; the first radio signal carries a paging message; the frequency domain resource used for transmitting the first signaling belongs to a first subband; the first subband comprises a positive integer number of consecutive subcarriers in frequency domain; and at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

2. The method according to claim 1, wherein any one of the X time intervals belongs to a first time window in time domain; the time length of the first time window is predefined; the first time window is divided into Y time intervals; the X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; the subcarrier spacing of subcarriers included in the first subband is used for determining Y; and a feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals.

3. The method according to claim 2, wherein the first time window belongs to one of Z time windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; any two of the Z time windows have an equal time length; and the feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.

4. The method according to claim 1, further comprising:

receiving a second radio signal;

wherein the second radio signal is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

5. The method according to claim 1, further comprising:

receiving a second signaling;

wherein the second signaling is used for determining Q subbands, Q being a positive

integer; the first subband belongs to one of the Q subbands; any one of the Q subbands comprises a positive integer number of consecutive subcarriers; and the feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands.

6. A method in a base station for paging, comprising:

transmitting a first signaling in a positive integer number of time intervals of X time intervals; and

transmitting a first radio signal;

wherein X is a positive integer; the first signaling is used for determining scheduling information for the first radio signal; the scheduling information comprises at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; the first radio signal carries a paging message; the frequency domain resource used for transmitting the first signaling belongs to a first subband; the first subband comprises a positive integer number of consecutive subcarriers in frequency domain; and at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

7. The method according to claim 6, wherein any one of the X time intervals belongs to a first time window in time domain; the time length of the first time window is predefined; the first time window is divided into Y time intervals; the X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X ; the subcarrier spacing of subcarriers included in the first subband is used for determining Y ; and a feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals.

8. The method according to claim 7, wherein the first time window belongs to one of Z time windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; any two of the Z time windows have an equal time length; and the feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.

9. The method according to claim 6, further comprising:

transmitting a second radio signal;

wherein the second radio signal is used for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

10. The method according to claim 6, further comprising:

transmitting a second signaling;

wherein the second signaling is used for determining Q subbands, Q being a positive integer; the first subband belongs to one of the Q subbands; any one of the Q subbands comprises a positive integer number of consecutive subcarriers; and the feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands.

11. A UE for paging, comprising:

- a first receiver module, to monitor a first signaling in X time intervals; and
- a second receiver module, to receive a first radio signal;

wherein X is a positive integer; the first signaling is used for determining scheduling information for the first radio signal; the scheduling information comprises at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; the first radio signal carries a paging message; the frequency domain resource used for transmitting the first signaling belongs to a first subband; the first subband comprises a positive integer number of consecutive subcarriers in frequency domain; and at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

12. The UE according to claim 11, wherein any one of the X time intervals belongs to a first time window in time domain; the time length of the first time window is predefined; the first time window is divided into Y time intervals; the X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X ; the subcarrier spacing of subcarriers included in the first subband is used for determining Y ; and a feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals.

13. The UE according to claim 12, wherein the first time window belongs to one of Z time windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; any two of the Z time windows have an equal time length; and the feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.

14. The UE according to claim 11, wherein the first receiver module further receives a second radio signal; the second radio signal is for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

15. The UE according to claim 11, wherein the first receiver module further receives a second signaling; the second signaling is for determining Q subbands, Q being a positive integer; the first subband belongs to one of the Q subbands; any one of the Q subbands comprises a positive integer number of consecutive subcarriers; and the feature ID of the monitor of the first

signaling is used for determining the first subband in the Q subbands.

16. A base station for paging, comprising:

a first transmitter module, to transmit a first signaling in a positive integer number of time intervals of X time intervals; and

a second transmitter module, to transmit a first radio signal;

wherein X is a positive integer; the first signaling is used for determining scheduling information for the first radio signal; the scheduling information comprises at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}; the first radio signal carries a paging message; the frequency domain resource used for transmitting the first signaling belongs to a first subband; the first subband comprises a positive integer number of consecutive subcarriers in frequency domain; and at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

17. The base station according to claim 16, wherein any one of the X time intervals belongs to a first time window in time domain; the time length of the first time window is predefined; the first time window is divided into Y time intervals; the X time intervals are X time intervals of the Y time intervals, Y being a positive integer not smaller than X; the subcarrier spacing of subcarriers included in the first subband is used for determining Y; and a feature ID of a monitor of the first signaling is used for determining the X time intervals in the Y time intervals.

18. The base station according to claim 17, wherein the first time window belongs to one of Z time windows, Z being an integer greater than 1; Z is predefined, or Z is configurable; any two of the Z time windows have an equal time length; and the feature ID of the monitor of the first signaling is used for determining the first time window in the Z time windows.

19. The base station according to claim 16, wherein the first transmitter module further transmits a second radio signal; the second radio signal is for determining at least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband}.

20. The base station according to claim 16, wherein the first transmitter module further transmits a second signaling; the second signaling is for determining Q subbands, Q being a positive integer; the first subband belongs to one of the Q subbands; any one of the Q subbands comprises a positive integer number of consecutive subcarriers; and the feature ID of the monitor of the first signaling is used for determining the first subband in the Q subbands.

ABSTRACT

The present disclosure provides a method and a device in a User Equipment (UE) and a base station used for paging. The UE first monitors a first signaling in X time intervals respectively, and then receives a first radio signal. The first signaling is used for determining scheduling information for the first radio signal. The scheduling information includes at least one of {occupied time-frequency resource, adopted MCS, subcarrier spacing of subcarriers in occupied frequency domain resource}. The first radio signal carries a paging message. The frequency domain resource is used for transmitting the first signaling belongs to a first subband. The first subband includes a positive integer number of consecutive subcarriers in frequency domain. At least one of {location of the first subband in frequency domain, subcarrier spacing of subcarriers included in the first subband} is used for determining the X time intervals.

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**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING
<p>As the below named inventor, I hereby declare that:</p> <p>This declaration is directed to: ☒ The attached application, or ☐ United States application or PCT international application number _____ filed on _____</p> <p>The above-identified application was made or authorized to be made by me.</p> <p>I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.</p> <p>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.</p> <p>WARNING:</p> <p>Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.</p> <p>LEGAL NAME OF INVENTOR</p> <p>Inventor: <u>XiaoBo ZHANG</u> Date (Optional): <u>Apr. 12 2018</u></p> <p>Signature: <u>XiaoBo ZHANG</u></p> <p>Note: An application data sheet (PTO/AIA/14 or equivalent), including naming the entire inventive entity, must accompany this form. Use an additional PTO/SB/AIA01 form for each additional inventor.</p>	

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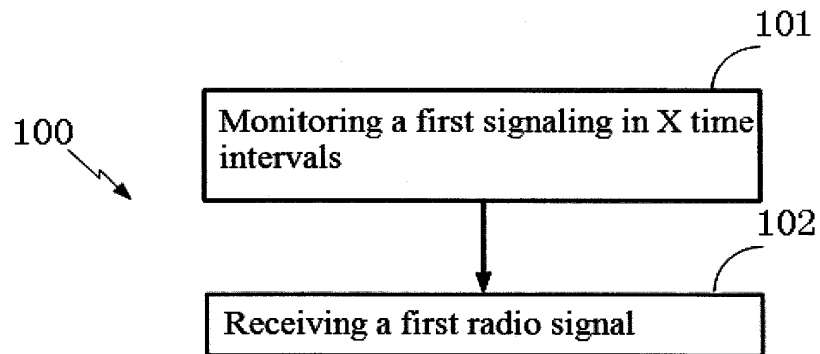


FIG. 1

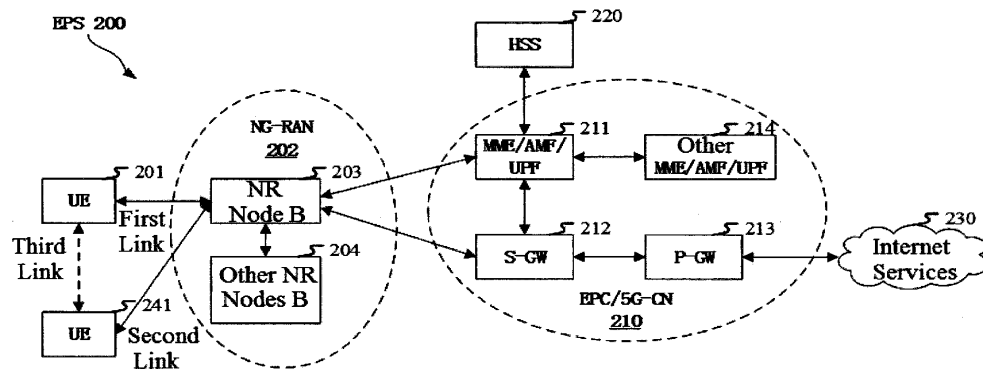


FIG. 2

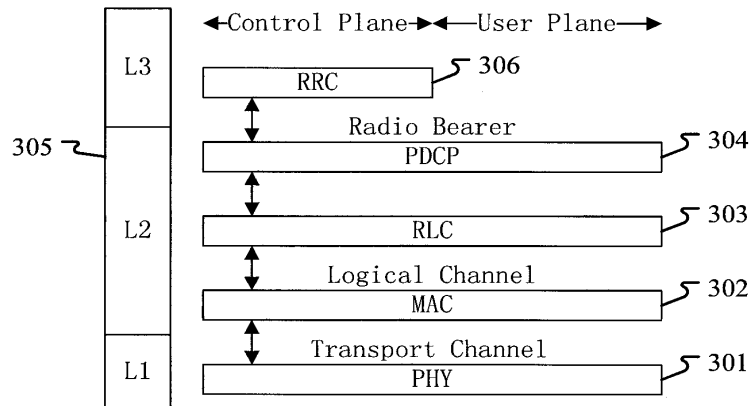


FIG. 3

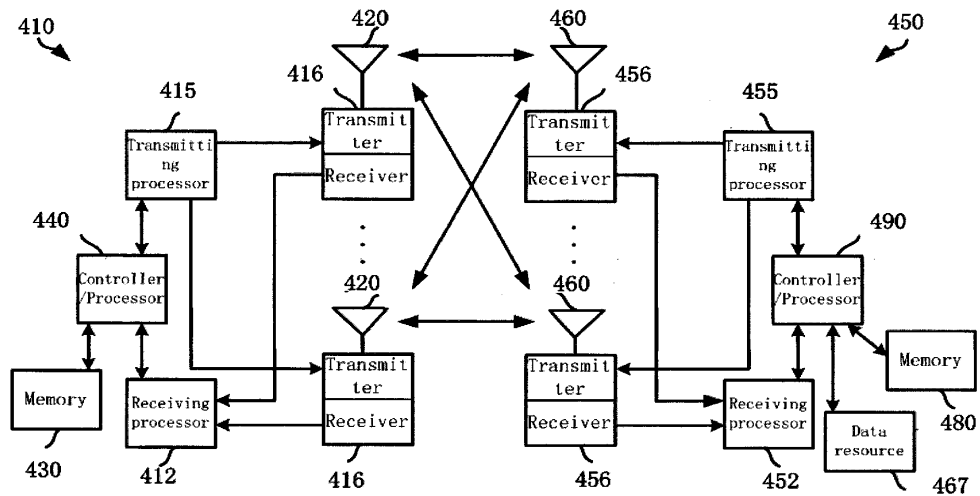


FIG. 4

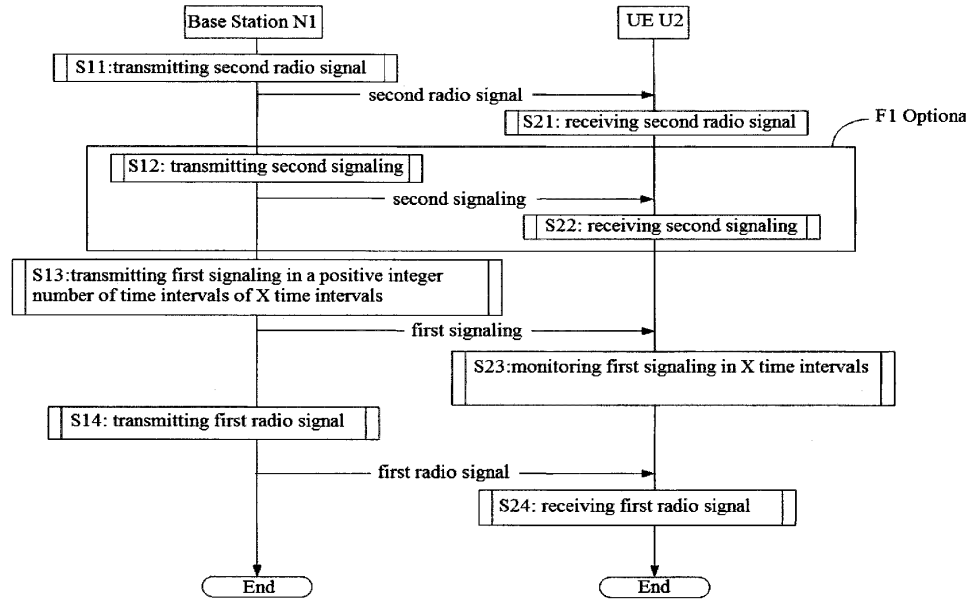


FIG. 5

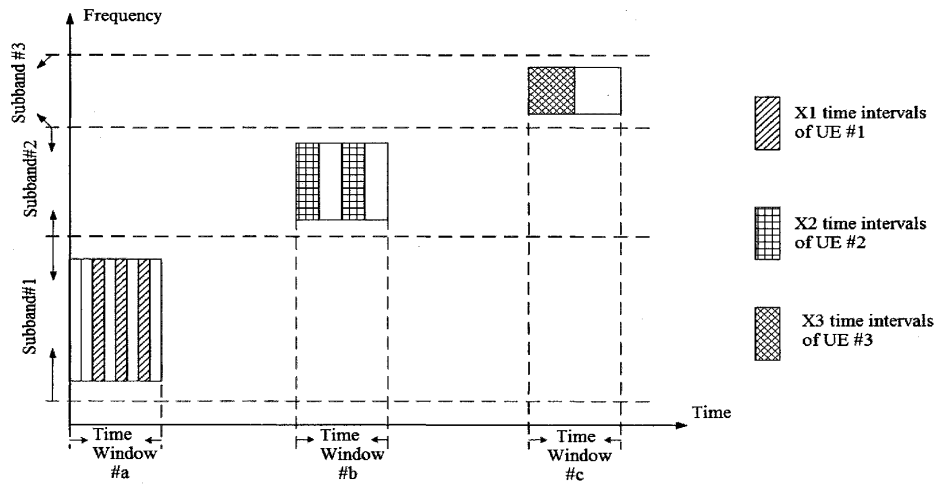


FIG. 6

	Index of X=1 time interval in the first time window			
	Feature ID=a	Feature ID=b	Feature ID=c	Feature ID=d
Y=1	0	0	0	0
Y=2	0	1	0	1
Y=4	0	1	2	3
Y=8	1	3	5	7
Y=16	2	6	10	14

FIG. 7

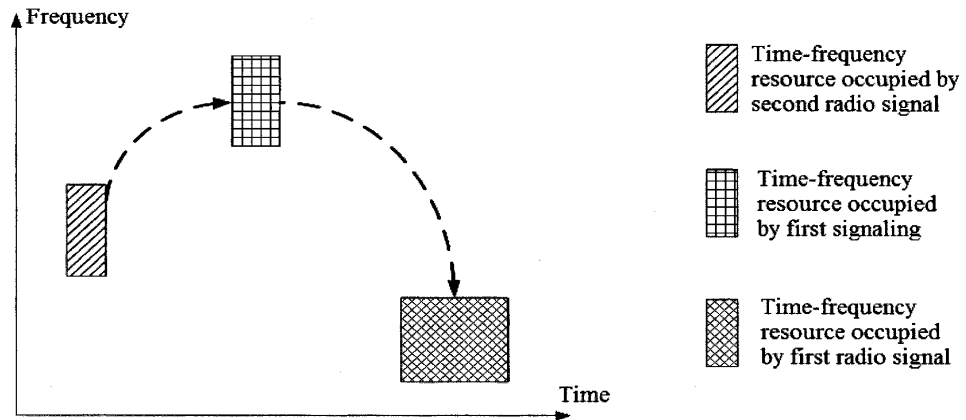


FIG. 8

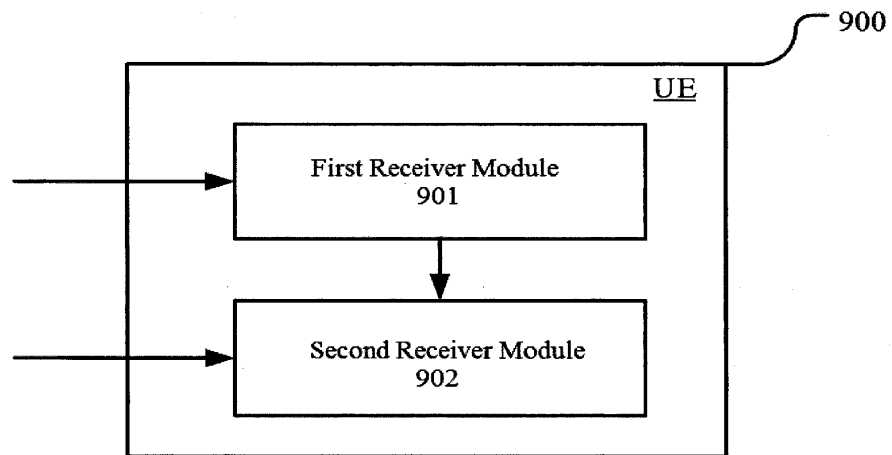


FIG. 9

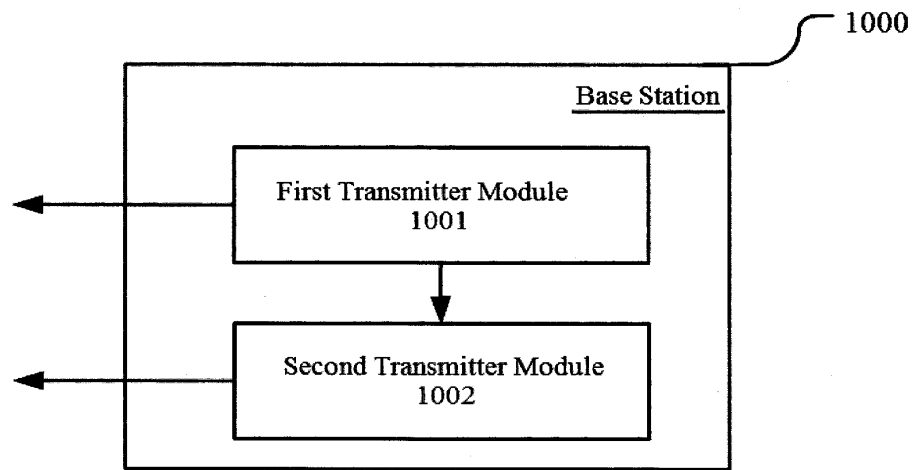


FIG. 10

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING		
First Named Inventor/Applicant Name:		Xiaobo ZHANG		
Filer:		Aaron Richard Wininger		
Attorney Docket Number:		126099-8010.US00		
Filed as Small Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	75	75
UTILITY SEARCH FEE	2111	1	330	330
UTILITY EXAMINATION FEE	2311	1	380	380
Pages:				
Claims:				
INDEPENDENT CLAIMS IN EXCESS OF 3	2201	1	230	230
Miscellaneous-Filing:				
Petition:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1015

Electronic Acknowledgement Receipt	
EFS ID:	32380289
Application Number:	15956742
International Application Number:	
Confirmation Number:	1787
Title of Invention:	METHOD AND DEVICE IN UE AND BASE STATION USED FOR PAGING
First Named Inventor/Applicant Name:	Xiaobo ZHANG
Customer Number:	70416
Filer:	Aaron Richard Wininger
Filer Authorized By:	
Attorney Docket Number:	126099-8010.US00
Receipt Date:	18-APR-2018
Filing Date:	
Time Stamp:	23:59:15
Application Type:	Utility under 35 USC 111(a)

Payment information:

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37 CFR 1.20 (Post Issuance fees)					
37 CFR 1.21 (Miscellaneous fees and charges)					
File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	1260998010US00ADS.PDF	1823025	no	8
			92ed1991432c7892f2330d137c8d21d56136c26a		
Warnings:					
Information:					
2		App.pdf	316747	yes	41
			2d6f3404b4a14c048668435e9c65582bcd9c27e		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	36	
	Claims		37	40	
	Abstract		41	41	
Warnings:					
Information:					
3	Oath or Declaration filed	Dec.pdf	115099	no	1
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Warnings:					
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4	Drawings-only black and white line drawings	Drawings.pdf	233835	no	6
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5	Fee Worksheet (SB06)	fee-info.pdf	37004	no	2
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